U.S. DEPARTMENT OF ENERGY

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Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Global Threat Reduction Initiative (GTRI)

PNNL GTRI Convert Program Program Management Plan

National Nuclear Security Administration (NNSA) Sector
Office of Global Threat Reduction (NA-21) Account

April 2013

Pacific Northwest NATIONAL LABORATORY

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Global Threat Reduction Initiative (GTRI)
PNNL GTRI Convert Program
Program Management Plan

April 2013

The contents of this Program Management Plan pertain to the following PNNL project numbers:

Global Threat Reduction Program Convert—64154
Fuel Characterization—62501
B&W Contracting (Capital Procurement)—63240
B&W Contracting (Engineering Services)—63644
M&O Assignments (Labor)—56392
M&O Assignments (Dislocation)—56393
M&O Assignments (Travel)—56394

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PMP Revision History

Revision Number	Comments	Revision Date	Effective Date
0.0	Initial GTRI Convert Program Management Plan Release		4/26/2013

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Acronyms and Abbreviations

ATR	Advanced Test Reactor
B&W	Babcock & Wilcox
B&W NOG-L	B&W Nuclear Operations Group—Lynchburg
BCR	baseline change request
CBNS	Chemical, Biological, and Nuclear Surety
CR	Continuing Resolution
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy—Headquarters
EPR	electronic prep and risk
ERICA	Electronic Records and Information Capture Architecture
ES&H	environment safety and health
FD	fuel development
FFC	fuel fabrication capability
FinPlan	financial plan
FY	fiscal year
GTRI	Global Threat Reduction Initiative
HDI	“How Do I?” (PNNL’s Standards-Based Management System)
HEU	highly enriched uranium
HFIR	High Flux Isotope Reactor
HPRR	high performance research reactor
INL	Idaho National Laboratory
IOPs	integrated operations system
IR	information release
IRE	Institute for Radioelements
LEU	low enriched uranium
LEU-Mo	low enriched uranium-molybdenum
MITR	Massachusetts Institute of Technology Reactor
MURR	Missouri University Research Reactor
NA-21	NNSA Office of Global Threat Reduction
NBSR	National Bureau of Standards Reactor
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
NSD	PNNL’s National Security Directorate
NTL	national technical lead
OUO	official use only
PI	principal investigator

PM	project manager
PMB	performance management baseline
PMI	project management integrator
PMO	project management office
PMP	Program Management Plan
PNNL	Pacific Northwest National Laboratory
POC	point of contact
PWP	Project Work Plan
QA	quality assurance
QC	quality control
RC	reactor conversion
RDM	Risk Determination Matrix
RERTR	Reduced Enrichment for Research & Test Reactors
RIDS	Records Inventory and Disposition Schedule
RPL	PNNL's Radiochemical Processing Laboratory
SAR	safety analysis report
STARS	Standard Accounting and Reporting System
TOR	technical oversight representative
TREAT	Transient Reactor Test facility
U-Mo	uranium-molybdenum
U.S. HPRR	U.S. High Performance Research Reactor
WBS	work breakdown structure

Contents

Figures

Tables

1.0 Introduction

1.1 GTRI Convert Mission, Goals, and Objectives

The National Nuclear Security Administration (NNSA) Global Threat Reduction Initiative (GTRI) strategic mission[1] includes efforts to reduce and protect vulnerable nuclear and radiological material at civilian sites around the world. Converting research reactors from using highly enriched uranium (HEU) to low enriched uranium (LEU) was originally started in 1978 as the Reduced Enrichment for Research and Test Reactors Program under the U.S. Department of Energy (DOE) Office of Science. In 2004, the NNSA established the GTRI by combining five existing programs, including the Reduced Enrichment for Research and Test Reactors Program, under one combined threat reduction initiative to focus on one common mission. Within this strategic mission, the GTRI has three goals that provide a comprehensive approach to achieving this mission: 1) convert research reactors from using HEU to LEU, 2) remove or dispose of excess nuclear and radiological materials, and 3) protect nuclear and radiological material from theft and sabotage. The GTRI Convert mission seeks to minimize and, to the extent possible, eliminate HEU in civilian applications throughout the world through the conversion of research reactors. Once that need is eliminated, remaining HEU fresh and spent fuel can be removed or disposed of by GTRI's Remove activities. Attainment of the Convert objectives will permanently reduce the availability and affiliated transactions of HEU materials, thus eliminating a substantial threat to proliferation. GTRI's Convert mission is comprised of two sub-programs: the GTRI Reactor Conversion Program and the Mo-99 Capability Development Project.

The GTRI Reactor Conversion Program's goal is to eliminate the global inventory of approximately 1,000 kg of HEU annually by converting research reactors to use LEU-based fuel, while at the same time ensuring the viability and sustainability of important civilian nuclear research and development programs of those facilities undergoing conversion. In order to accomplish this goal, the GTRI Convert mission has defined specific objectives to complete the conversion of approximately 200 domestic and international civilian research reactors to use LEU fuels by 2030. Of these 200, 33 are in the U.S. and the rest are in foreign countries. Most of these U.S. reactors have already converted, except for the five U.S. high performance research reactors (HPRRs) that require new fuel. These five reactors and one critical assembly are part of a group of approximately 27 research reactors worldwide that cannot be converted using existing commercially available LEU fuels. Development of a new fuel is part of the GTRI Convert mission and funding requirement.

The goal of the United States High Performance Research Reactor (U.S. HPRR) Program is to eliminate approximately 250 kg of HEU annually by converting the five high performance research reactors and one critical assembly while maintaining their viability and sustainability. The objective for the U.S. HPRR Program is to convert three U.S. Nuclear Regulatory Commission (NRC) licensed HPRRs by 2025 two DOE regulated HPRRs, and one associated critical assembly by 2030. The objective requires a new, high density, low enriched fuel to be qualified for use in these reactors, as well as the establishment of a capability to fabricate the qualified fuel. Fuel provided for conversions includes the fuel elements required to accomplish steady-state operations, but not to maintain operation.

[1] GTRI Strategic Plan, January 2009.

The U.S. HPRR Program has been divided into three primary technical pillars:

- fuel development (FD)—develop and qualify a new, high density low enriched uranium-molybdenum (LEU-Mo) fuel and associated technologies that meets performance requirements of the HPRRs
  - the objective of the FD pillar is to develop a replacement LEU fuel that meets the following basic requirements:
    - provide a fuel that has similar operational parameters to those provided by the HEU fuel currently used and not incur major changes to the reactor structure without significantly compromising the reactor's current reactivity and operation
    - demonstrate the integrity and performance of the fuel through testing
    - provide a fuel that meets the reactor requirements and has an acceptable safety margin
- fuel fabrication capability (FFC)—establish a cost-effective and efficient fuel fabrication capability that can be transferred to a commercial fuel fabricator that will provide LEU-Mo fuel to U.S. HPRRs upon conversion
  - the objective of the FFC pillar is to:
    - provide LEU-Mo fabrication capability to support the conversion of the five U.S. HPRRs and one critical assembly
    - provide initial loadings to support conversions
    - transfer fabrication knowledge and processes to a commercial fuel fabrication entity
    - fabricate and produce the fuel in the most cost effective and efficient manner
    - establish future procurement of LEU-Mo fuel.
- reactor conversion (RC)—assist reactors with feasibility studies and operational analyses (performance and safety) to enable the safe and effective conversion of reactors to the new LEU-Mo fuels
  - the objective of the RC pillar is to:
    - develop feasibility studies to evaluate if conversion can be accomplished without loss of performance required to carry out existing reactor missions
    - work with reactor operators to clearly define operational and safety requirements of LEU fuel to match behavior of the existing HEU cores as closely as reasonable
    - perform the operational and safety analyses to support licensing of the conversion to LEU fuels.

The Mo-99 Capability Development Project is motivated by efforts to phase out U.S. exports of HEU for medical isotope production and also to increase the reliability of medical isotope supplies. The strategy for developing reliable non-HEU based Mo-99 supplies includes international conversion from HEU to LEU along with encouraging the development of domestic Mo-99 supplies that will use LEU.

- Mo-99:
  - the objective of the Mo-99 effort is to:

- convert Mo-99 targets worldwide from HEU to LEU
- promote several new domestic sources of Mo-99 production via cooperative agreements with industry partners.

1.2 Organization

The Pacific Northwest National Laboratory (PNNL) GTRI Convert Program is one of three program areas aligned with the NNSA Market Sector under the NNSA Office of Global Threat Reduction (NA-21) Account, along with the Protect and Remove programs.

Shown below are the NA-21 U.S. Department of Energy—Headquarters (DOE-HQ) organization chart, the PNNL NA-21 Account organization chart, and the PNNL GTRI Convert organization chart in Figures 1.1, 1.2, and 1.3.

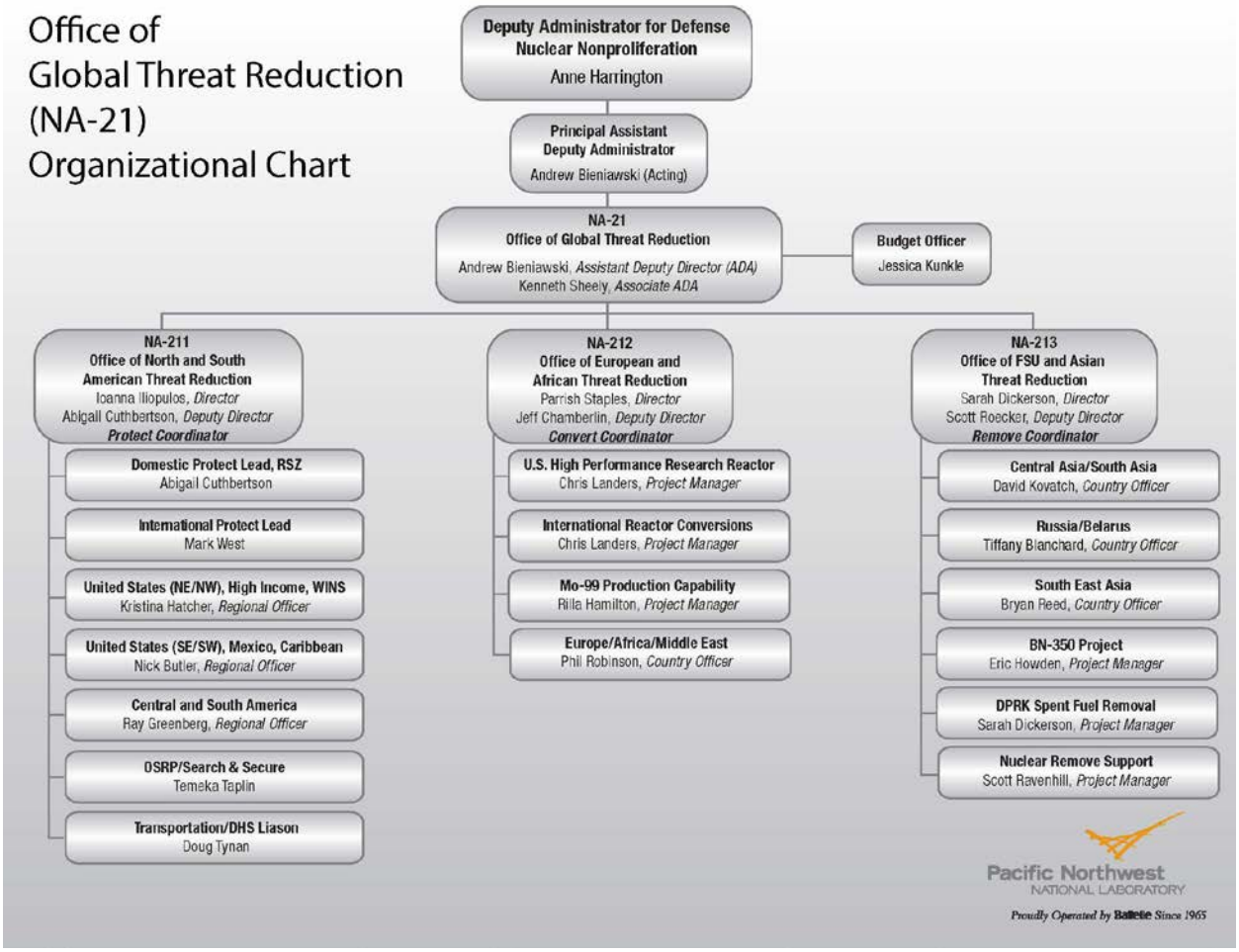

Figure 1.1. NA-21 DOE-HQ Organizational Chart

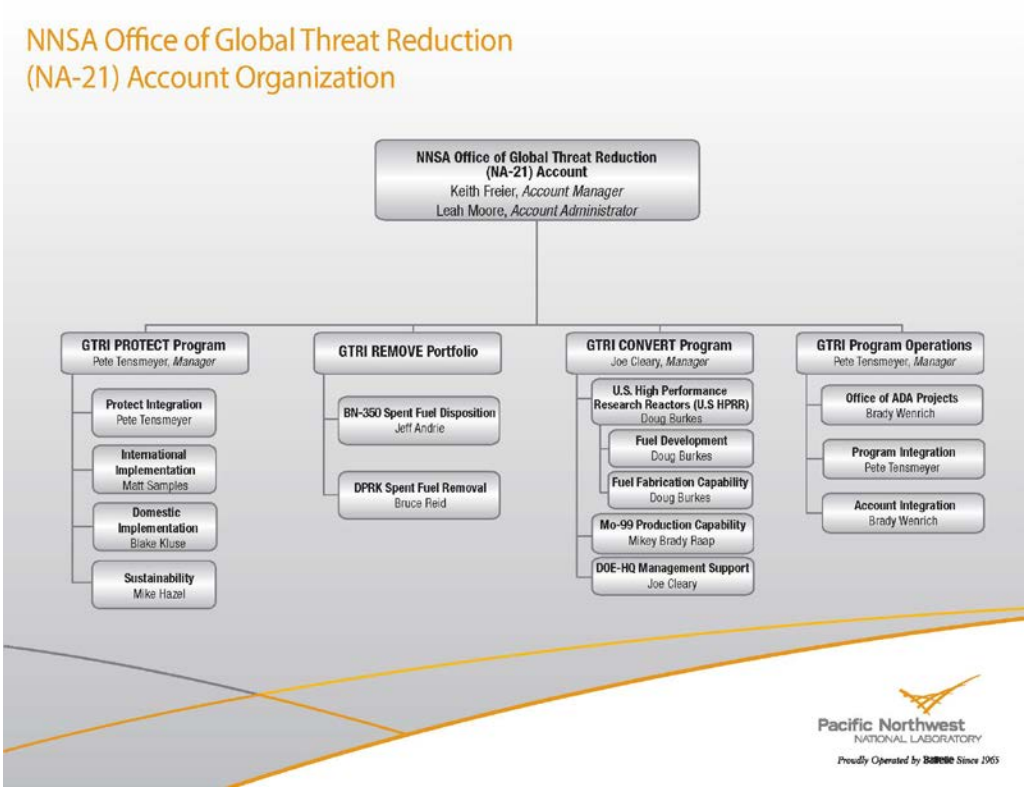

Figure 1.2. PNNL NA-21 Account Organization

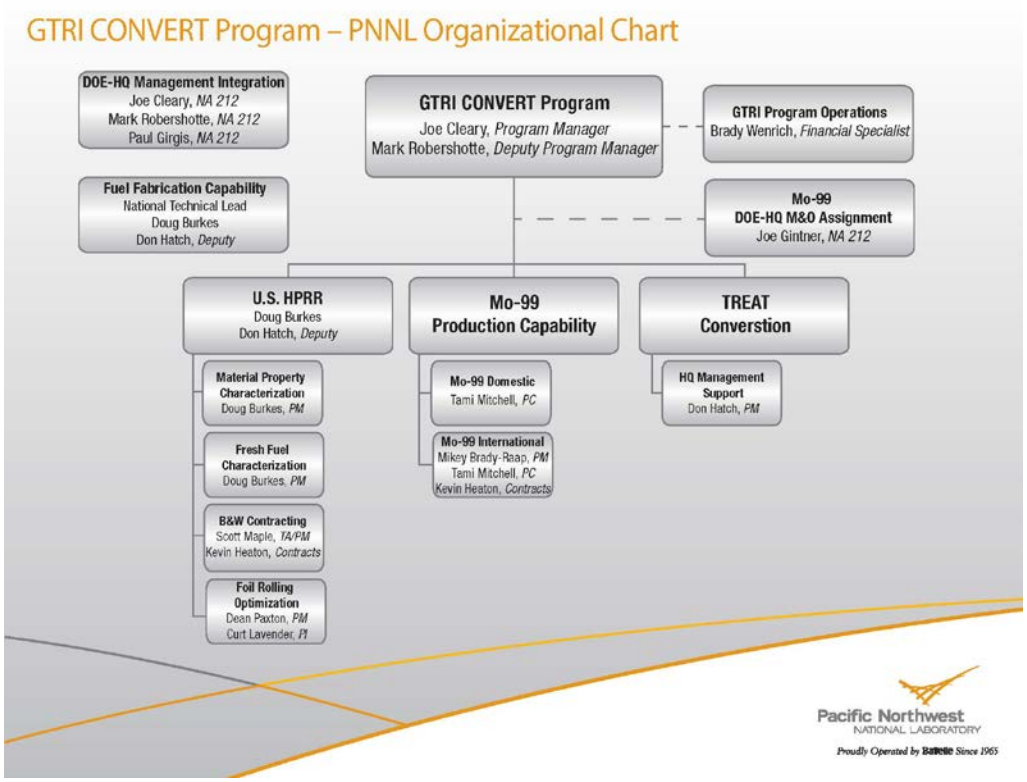

Figure 1.3. PNNL GTRI Convert Organizational Chart

1.3 Plan Purpose and References

The purpose of this Program Management Plan (PMP) is to address the planning requirements and guidelines necessary for the efficient execution of the PNNL GTRI Convert Program. This PMP provides overall guidance for the management of the program and for the development of any subordinate plans. Source documents addressed in this plan include:

- DOE's NNSA GTRI Strategic Plan, Program Management Plan (PMP), and the Convert Portfolio Plan (CPP). Other important documents from HQ include the 2013 rev 0 versions of the GTRI U.S. HPRR Conversion Program Project Execution Plan, GTRI Convert Work Packages, Quality Assurance Program Document, Risk Management Plan, and Scope document
- *Global Threat Reduction Initiative (GTRI) PNNL Program Implementation Guidelines*, National Nuclear Security Administration (NNSA) Sector, Office of Global Threat Reduction Initiative (NA-21) Account, dated April 2013 including all reference documents therein
- *"How Do I...?" Project Management* subject area.

This PNNL GTRI Convert PMP is subordinate to the PNNL GTRI Program Implementation Guidelines document, which takes precedence in the event of any contradictions or omissions within this plan.

The NNSA GTRI Strategic Plan explains the convert, remove and protect (three pillars) objectives, key steps, and performance metrics in general. The DOE PMP provides details on GTRI's structure and management processes and expectations for all technical pillars. The Convert Portfolio Plan narrows the scope from the three technical pillars to only the Conversion Program and then further defines the sub-components of the Convert Portfolio, which are the Reactor Convert Program and the Mo-99 Program.

2.0 Scope of Work

GTRI is responsible for the conversion of reactors worldwide from HEU to LEU; in addition, they have been tasked with conversion of Mo-99 targets from HEU to LEU. The Mo-99 Program is also promoting several new sources of Mo-99 production via cooperative agreements with industry partners. Besides the Mo-99 Program, the PNNL GTRI Convert Program includes the U.S. HPRR Conversion Program. The plan is to convert to LEU-Mo fuel the five U.S. HPRRs and one critical assembly, which are listed below:

- the Massachusetts Institute of Technology Reactor (MITR)
- the Missouri University Research Reactor at the University of Missouri–Columbia (MURR)
- the National Bureau of Standards Reactor at the National Institute of Standards and Technology in Maryland (NBSR)
- the Advanced Test Reactor (ATR) and the associated critical assembly (ATR-C) both at Idaho National Laboratory (INL)
- the High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory.

This U.S. HPRR Program includes:

- developing, testing, and qualifying the new monolithic LEU fuel
- establishing a commercial supply of the new fuel
- assisting reactor operators with safety and conversion analysis
- procuring fabrication equipment for the fuel supplier
- procuring the initial conversion fuel.

The PNNL U.S. HPRR scope comes in the form of unique fuel performance analysis and expertise, unirradiated and irradiated fuel and material characterization, contracting and technical services support, and advanced fabrication research and development. Work scope conducted at PNNL is essential to furthering the GTRI mission and typically contributes to GTRI activities on the critical path.

There are two work breakdown structure (WBS) systems for U.S. HPRR. One is the DOE-HQ G2 system with WBS elements in the 21 series. There is also a lower level WBS used for the U.S. HPRR integrated schedule as identified by the (0X.0X.0X) numbers in Figure 2.1. The cross walk between the two systems is shown in Figure 2.1. Note: Only the scope areas where PNNL has work are included. For the Mo-99 Program, which is separate from U.S. HPRR, only the G2 system WBS is used.

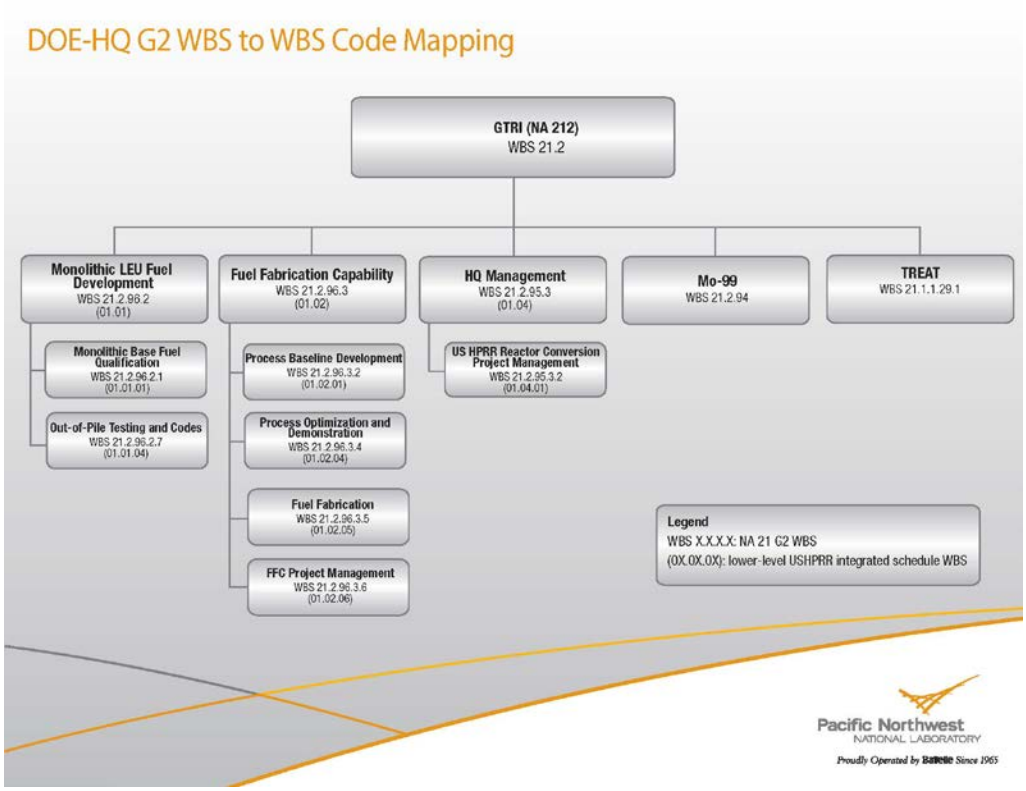

Figure 2.1. DOE-HQ G2 WBS to WBS Code Mapping

2.1 Monolithic Base Fuel Qualification (Project 62501)

PNNL provides input to the FD pillar in support of qualification of the monolithic base fuel form based on certain areas of expertise. Activities performed early in FY 2013 included the AFIP-7, Surface Science Characterization, and Base Fuel Qualification Characterization reports.

2.2 Out of pile Testing and Codes, Material Properties Characterization (Project 62501)

A key part of the USHPRR Program under the fuel development pillar is the Fuel Thermo-Physical Characterization Project. The Fuel Thermo-Physical Characterization Project is a "special project." The project charter is to ready PNNL facilities and processes for the receipt of unirradiated and irradiated LEU-Mo fuel element samples and to perform analysis to support the GTRI Conversion Program. PNNL's support for the program will include establishment of post irradiation examination processes unique to the DOE laboratories that include thermo-physical properties and ultimately supporting submission of the base fuel qualification to the NRC and revisions to U.S. HPRR safety analysis reports (SARs) to enable conversion from HEU to LEU fuel.

As part of the out-of-pile testing codes scope of work, PNNL has been tasked to provide three correlations for determining the mechanical properties of U-Mo fuel:

1. The mechanical properties of depleted uranium plus 10 weight percent molybdenum alloy have been evaluated by high temperature compression testing.

2. The thermo-physical properties (heat capacity, thermal diffusivity) of irradiated U-Mo fuel plates as a function of temperature and burnup.
3. Characterization of off-gas resulting from melting U-Mo fuel plates as a function of time, temperature and burnup.

2.3 Process Baseline Development (Project 62501)

PNNL will characterize as-cast U-Mo samples in support of the Process Baseline Development effort. In particular, optical microscopy, scanning electron microscopy (SEM), and energy dispersive spectroscopy / wavelength dispersive spectroscopy (EDX/WDX) will be utilized to investigate variations in composition and other metallographic features. Micro hardness measurements will be conducted to determine if (and to what extent) transformation/decomposition has occurred during solidification, as well as assist in drawing conclusions from any of the metallographic observations.

2.4 Process Optimization and Demonstration, Foil Rolling Optimization Studies (Project 62501)

The Foil Rolling Optimization Project provides research and development support to the GTRI FFC pillar. In particular, the project focuses on optimization of foil rolling processes, which include the U-10Mo Zr hot co-rolled and bare U-10Mo hot/cold rolling foil fabrication processes. In addition, the project identifies and investigates the feasibility of novel Zr diffusion barrier application methods to bare U-10Mo fuel foils, such as energetic pulse joining, co-extrusion, and chemical plating. In addition, existing PNNL capabilities are deployed to reduce the backlog of examination from other DOE laboratories on unirradiated U-Mo samples in support of the overall LEU-Mo characterization program as well as provide an active feedback loop on fabrication process development work.

2.5 Fuel Fabrication, Babcock & Wilcox Contracting (Projects 63240 and 63644)

A key area of the fuel fabrication capability pillar is the Babcock & Wilcox (B&W) Contracting Project. This project is designed to adapt existing B&W capabilities to provide fabrication capabilities to manufacture LEU-Mo fuel types from the point of receipt of LEU-Mo coupons from the Y-12 National Security Complex to finished fuel elements ready for use in the reactor. LEU-Mo fuel represents a new fuel type that has not been commercially manufactured. The manufacture of this fuel poses new design considerations and challenges. To transition from production of HEU fuels to LEU fuels and meet near term milestones, it is necessary to develop this capability in two phases: 1) establish a limited LEU production facility that shares equipment and space with the existing HEU production line, and 2) establish a full LEU production facility the with capability to manufacture all LEU fuel needed to support the ongoing needs of the MURR, MITR, NBSR, ATR, and HFIR reactors that are the last remaining U.S. reactors currently utilizing HEU fuel. The project serves as the contracting vehicle between GTRI and B&W Nuclear Operations Group-Lynchburg (B&W NOG-L). Contracts will support engineering, equipment specification, licensing approval, facility upgrade, equipment procurement, installation, equipment startup, and qualification.

2.6 Fuel Fabrication Capability Project Management (Project 64154)

The FFC national technical lead (NTL) is appointed by NA-212 GTRI Program Management to establish and guide the technical direction and accomplishment of FFC-related scope. In particular, it is the FFC NTL responsibility to oversee the establishment of a baseline fuel fabrication process, development of high quality demonstration products, maturing the baseline and alternative technologies, and managing the contracts and transition to a commercial contractor.

2.7 US HPRR Reactor Conversion Project Management (Project 64154)

PNNL serves as the project management integrator (PMI) for the U.S. HPRR Conversion Programs. This role involves the integration of the scope, schedule, and budgets for the eight national laboratories that participate in the program. The PNNL team manages the schedule and actual cost/commitments for each of the laboratories. Risk management planning and maintenance is also a major role of the DOE-HQ management integration team. Programmatic documentation such as fiscal year (FY) work packages, scope documents, risk management plans, QA documentation, functional and operational requirements and project execution plans are also maintained by this team. In February 2013, NA-212 asked PNNL to provide the same level of support to a new TREAT conversion project. Work on this project has just recently commenced and is all project management work.

2.8 Mo-99 (Project 64154)

The Mo-99 International Program provides assistance to international research reactors and isotope production facilities to convert from the use of HEU targets to LEU targets. The Mo-99 Domestic Program provides assistance to accelerate the establishment of reliable, commercial production of non-HEU-based Mo-99 in the U.S.

PNNL's specific scope is summarized below:

- technical services
  - provide program management/controls support to the Mo-99 Project
  - assist in the development/management of the project performance baseline and maintenance of the integrated project schedule
  - provide support to the GTRI headquarters team in preparing the Mo-99 monthly executive report
  - integrate project schedule status for the national laboratories and managing the Mo-99 SharePoint site.
  - provide management and oversight of the independent technical review contract, to support the Mo-99 domestic projects
  - provide technical expertise through a contract with Yamasato Fujiwara Higa for participation in the annual Mo-99 topical meeting
  - perform semi-annual technical reviews of the four cooperative agreement partners
  - provide additional technical review support as required

- Institute for Radioelements (IRE) conversion support
  - provide contract management support to the GTRI Mo-99 Program
  - collaborate to convert medical isotope production facility located in Fleurus, Belgium, from using HEU targets to LEU targets
  - manage the contract that provides support to the conversion of the production medical isotopes at the IRE facility.

2.9 M&O Assignments

PNNL staff members occasionally have the opportunity to serve in M&O assignments at DOE-HQ. One or more could support GTRI Convert. The subaccounts for M&O assignments include 56392 (labor), 56393 (dislocation), and 56394 (travel).

2.10 Deliverables and Program Milestones

A list of PNNL GTRI Convert Program FY 2013 deliverables and milestone schedule activities (Table 2.1) identifying the work that will be performed in each respective area is shown below.

Table 2.1. Project Deliverables and Milestones

PNNL's Radiochemical Processing Laboratory (RPL) Receives for Irradiated Fuel Samples	April 2013
Initiate Sample Preparation / Segmentation of irradiated LEU-Mo fuel samples	March 2013
Issue Foil Rolling Optimization Final Report	March 2014
Demonstrate feasibility of alternative Zr application methods	November 2013
Complete RPL Sample Segmentation (2 thermal, 2 STA_MS)	September 2013
Complete procurement of foil cleaning diamond polisher for B&W NOG-L	December 2013
Complete RPL Laser Flash Analysis (3 segments)	September 2013
Complete installation of the Cold Rolling Mill at B&W NOG-L	May 2014
Complete installation of the vacuum anneal furnace at B&W NOG-L	May 2014
RPL Complete Thermo-physical Examination of Post Irradiated Fuel ** (4 Segments)	September 2013
Issue final report on irradiated LEU-Mo fuel samples provided by INL	December 2013
Issue report on interrupted rolling tests	February 2014
Complete procurement of UT system for B&W NOG-L	June 2014
Complete PNNL Material Properties support closeout	April 2014
Issue final report on alternative Zr application methods	May 2015
RPL Cell cleanout – Project Closeout***	April 2014
Issue final report on complex fuel fabrication alternatives	October 2015

** 4 Segments (2 Thermal, 1 high flux, 1 low flux) (2 STA-MS, 1 high flux, 1 low flux) additional 4 segments may be analyzed pending release of funding from INL
***Pending FY 2014 funding of project closure

2.11 Program Budget

The budget is approved on an FY basis via the individual DOE NA funding authorizations. Funds are identified by project and by laboratory, and are provided through the authorized financial plan system. PNNL will manage and complete the agreed upon project work scope within the project funding provided.

No work is to begin unless it is both authorized via an approved project work plan (PWP) and funding has been received at the laboratory through the client's authorized financial plan.

At the start of a FY, it is possible that the NNSA's overall budget has not been approved by Congress, therefore, funding is authorized under a "Continuing Resolution" (CR). When this is in effect, full funding is not necessarily initially provided to the laboratories to complete the work scope identified in the approved project task sheets. During these times, the program and project managers and task leads will work closely with the financial specialist to make sure that work progresses as smoothly as possible. It should be noted that large dollar-value commitments may be affected because of this reduced funding situation.

3.0 Roles and Responsibilities

The roles, responsibilities, and lines of authority for management and staffing positions at PNNL that directly or indirectly support the PNNL GTRI Convert Program are described below.

The project management office (PMO) is responsible for making sure that project performance is high quality and that the risks associated with the project work are being managed effectively.

Line management of program team members is responsible for providing the staff needed to accomplish the work of the program. Line managers are also responsible for making sure that high quality service is provided to the program.

The PNNL GTRI Convert program manager, in coordination with the Chemical, Biological, and Nuclear Surety (CBNS) PMO, is responsible for expert delivery of all program activities in full compliance with customer requirements and expectations. The NA-21 account manager will be the single PNNL point of contact (POC) for all program-wide related issues, concerns, and expected performance objectives and strategies, and is the principle POC between DOE-HQ and PNNL for program activities in support of NA-21.

The PNNL GTRI Convert program manager, project managers (PMs), and other PNNL-assigned staff members are accountable to the NA-21 account manager and the CBNS PMO director for completion of assigned work on time, on budget, and in accordance with customer expectations. They are responsible for complying with all applicable laboratory policies, standards, and procedures.

All roles listed below are PNNL staff members. The cross cutting GTRI support positions (contracts manager and specialists, financial specialist, project controls lead and professionals, and program administrator) are included in the *PNNL Program Implementation Guidelines* document.

3.1 PNNL GTRI Convert Program Manager

The PNNL GTRI Convert program manager is responsible and accountable for successful execution of the PNNL GTRI Convert Program. Specific duties and responsibilities include, but are not limited to, the following:

- report to the DOE-HQ NA-212 director and deputy director for the successful execution of PNNL activities in support of the GTRI Convert mission
- report to the NA-21 account manager and CBNS PMO director for day-to-day execution of PNNL GTRI Convert activities
- develop business opportunities in support of the GTRI Convert mission
- serve as the principle PNNL POC for all PNNL GTRI Convert programmatic activities
- manage resource needs for the program and coordinate with other programs and organizations to provide resources
- coordinate with the PMO and sector manager to appropriately manage and mitigate risks, and to promote business development opportunities

- coordinate with line managers for program resource needs and staff development opportunities
- establish and maintain program management systems, policies, and procedures in accordance with PNNL policy, DOE-HQ program requirements, and "How Do I?" (HDI—PNNL's Standards-Based Management System)
- provide lead program integration and management support to DOE-HQ for all elements of the PNNL GTRI Convert Program
- provide support in the development of NA-212 program management systems, policies, procedures, and other DOE-HQ management infrastructure
- coordinate and respond to NA-212 program requests for information
- provide training and mentoring to program staff members and make sure that staff members understand all relevant GTRI Convert policies and procedures
- integrate with other programs to be sure of consistency and efficiency of management processes and approaches
- oversee development and maintenance of program management documentation and reporting
- oversee and track PNNL project performance within the program
- communicate with DOE NA-21 and NA-212 GTRI program management on a regular basis regarding progress and status of work
- track total program and individual project spending to make sure that budget requirements are maintained
- review and approve all GTRI Convert Program travel requests
- communicate problems, suggestions, and issues to PNNL' National Security Directorate (NSD) management and DOE GTRI management, as needed, for resolution.

3.2 DOE-HQ Project Management Integration Lead

PNNL serves as the PMI for the U.S. HPRR Conversion Program. This role involves the integration of the scope, schedule, and budgets for the eight national laboratories that participate in the program. The PNNL team manages the schedule and actual cost/commitments for each of the laboratories. Risk management planning and maintenance is also a major role of the HQ management integration team. This team is responsible for the following:

- develop and maintain the USHPRR integrated schedule
- update continuously the lifecycle budget information for the USHPRR projects (i.e. reconcile budget with G2 funding changes)
- develop and maintain detailed spend plans by WBS and by laboratory for the program
- develop and maintain the program SharePoint site
- administer the baseline change control process for the integrated scope, schedule, and budget

- obtain cost and commitment information from each laboratory at a level lower than what is reported in G2, and provide the results to HQ in a monthly report
- develop a monthly schedule status report
- develop and maintain the USHPRR scope document
- maintain the FY work packages for HQ
- develop and maintain the risk management plan for the program, including the monthly detailed schedule risk analysis that interfaces directly with the P6 schedule
- develop and maintain a program execution plan for the program.

3.3 Fuel Fabrication Capability National Technical (Pillar) Lead

The FFC NTL is appointed by NA-212 GTRI program management to establish and guide the technical direction and accomplishment of FFC-related scope. In particular, it is the FFC NTL responsibility to oversee the establishment of a baseline fuel fabrication process, development of high quality demonstration products, maturing the baseline and alternative technologies, and managing the contracts and transition to a commercial contractor. Other specific duties of the FFC NTL include, but are not limited to, the following:

- hold biweekly and monthly conference calls with the performing team (made up of multiple national laboratories and commercial entities) and fabrication product stakeholders
- generate, submit, and follow-through on any baseline change request (BCR) to the DOE-HQ PMI and the NA-212 GTRI program manager for necessary approvals
- compile, summarize, and submit results (in report form) to the NA-212 GTRI program manager, and disseminate the results to the U.S. HPRR community and international community as appropriate
- guide the transition of fuel fabrication technology from the DOE National Laboratory complex to a commercial fuel fabrication contractor (i.e., B&W NOG-L)
- oversee the scope and overall coordination of any new fuel fabrication contract regardless of which laboratory actually places the contract
- integrate with the GTRI FD and RC pillars to be sure of consistency with a consolidated GTRI plan and approach to qualify and deploy a LEU-Mo fuel.

Note: The FFC NTL also serves as the PNNL U.S. HPRR lead supervising the work of the fuel characterization, fuel fabrication B&W contracting/technical oversight representative (TOR), and process optimization and demonstration, foil rolling optimization PMs listed in Sections 3.4, 3.5, and 3.6 below.

3.4 Fuel Characterization Project Manager

The Fuel Characterization PM is responsible for the successful execution of all PNNL monolithic base fuel qualification, out-of-pile testing and codes, and irradiated fuel characterization activities. The PM is directly responsible for individual project performance and expert delivery in accordance with

NA-21 and PNNL policies and procedures, and within approved scope, schedule, budget, and quality. Specific duties and responsibilities include, but are not limited to, the following:

- manage the resource needs for the project and coordinate with other projects, programs, and organizations to provide resources, opportunities, and availabilities
- integrate with other projects and programs to be sure of consistency and efficiency of management processes and approaches
- coordinate and respond to NA-21 program requests for project information
- provide training and mentoring to project staff and make sure that staff understand and follow all relevant program policies and procedures
- develop and maintain all project management documentation and reporting, including PWPs, monthly reports, and performance metrics, financial reporting, and ad-hoc project management reporting to DOE-HQ via the PNNL GTRI Convert program manager
- oversee and track project performance
- track total project and individual sub-project spending to make sure that budget requirements are maintained
- oversee and coordinate all project activities to make sure that work is performed in accordance with approved PWPs
- communicate problems, suggestions, and issues to the PNNL GTRI Convert program manager, as needed, for resolution
- provide periodic reporting of progress, schedule, and costs to the PNNL GTRI Convert program manager.

3.5 Fuel Fabrication B&W Contracting Project Manager/TOR

The Fuel Fabrication B&W Contracting PM/TOR is assigned by the FFC NTL to oversee and manage work scope and contracts with B&W NOG-L. The B&W contracting PM/TOR specific duties and responsibilities include:

- develop statements of work and associated documentation required to meet the contractual requirements in support of FFC Project and task objectives in accordance with the FFC approved work scope and within established DOE/NNSA, NA-21, and PNNL GTRI contracting guidelines
- make sure that the risks associated with the contracting action required are properly identified
- work with the FFC NTL to request the necessary purchase requisition to initiate contracting mechanism
- work with the contracting officer to award the contract action, monitor contractor performance, review and approve deliverables for payment, and identify actions required to address scope or schedule issues
- coordinate and respond to FFC NTL requests for project information

- track total project and individual project spending to make sure that budget requirements are maintained
- communicate problems, suggestions, and issues to the FFC NTL, as needed, for resolution.

3.6 Process Optimization and Demonstration, Foil Rolling Optimization Project Manager

The Process Optimization and Demonstration, Foil Rolling Optimization PM is responsible for the successful execution of all PNNL activities directly attributable to FFC research and development work scope conducted at PNNL. The PM is directly responsible for individual project performance and expert delivery in accordance with NA-21 and PNNL policies and procedures, and within approved scope, schedule, budget, and quality. Specific duties and responsibilities include, but are not limited to, the following:

- manage the resource needs for the project and coordinate with other projects, programs, and organizations to provide resources, opportunities, and availabilities
- integrate with other projects and programs to be sure of consistency and efficiency of management processes and approaches
- coordinate and respond to FFC NTL requests for project information
- provide training and mentoring to project staff and make sure that staff understand and follow all relevant program policies and procedures
- develop and maintain all project management documentation and reporting, including PWPs, monthly reports, and performance metrics, financial reporting, and ad-hoc project management reporting to DOE-HQ via the FFC NTL
- oversee and track project performance
- track total project and individual sub-project spending to make sure that budget requirements are maintained
- oversee and coordinate all project activities to make sure that work is performed in accordance with approved PWPs
- communicate problems, suggestions, and issues to the FFC NTL, as needed, for resolution
- provide periodic reporting of progress, schedule, and costs to the FFC NTL.

3.7 Mo-99 DOE-HQ Management Support M&O

The DOE-HQ management support M&O is responsible to provide direct program management support to the DOE Mo-99 Program in Washington D.C., and

- provide program management and technical integration support to the Mo-99 program manager
- assist in the development and improvement of project lifecycle plans, action plans, and management processes in support of NA-212

- assist NNSA in maintaining relationships and cooperative agreements with domestic and international partners within NA-212
- assist the Mo-99 program manager and project leads with integration and maintenance of the overall integrated performance management baseline (PMB)
- assist the Mo-99 program manager in developing program performance measures and evaluating program performance throughout the project's lifecycle
- assist in development of the Mo-99 monthly executive report and coordinate monthly executive reviews with the NA-212 office director and assistant deputy director
- recommend funding authorization changes for Mo-99 Program activities
- assist in the preparation of budget requests for FY funding utilizing the G2 project management system
- make sure that all required monthly updates are made to the G2 project management system
- initiate BCRs and implement them into the PMB once they are approved
- review technical progress and closeout reports and compare them against PMB to make sure that ongoing work is consistent with the agreed upon project objectives
- assist in the development and maintenance of the Mo-99 risk register
- provide programmatic guidance to the PNNL Mo-99 work package manager.

4.0 Environment, Safety and Health

The Fuel Characterization Project (62501) will perform out-of-pile characterization of irradiated fuel samples and the Foil Rolling Optimization Project will perform characterization and development work with unirradiated fuel samples. This involves operation of specific test equipment and working with radioactive materials. The project will characterize both unirradiated (consisting of U isotopes 235 and 238 and Mo) and irradiated fuel samples (consisting of multiple U and Pu isotopes, fission products, and Mo). See the Project Execution Plan (U.S. Department of Energy 2013) for specific environment safety and health (ES&H) details.

All work will be performed within integrated operations system (IOPs) and in accordance with the ES&H policies and procedures described in HDI management systems description

5.0 Contracts

All procurements and subcontracts will be handled as indicated in the HDI Purchasing Goods and Services subject area. Refer to the GTRI PNNL Program Implementation Guidelines document dated April 2013, for specific program guidance.

6.0 Reporting Requirements

6.1 Contracts Reporting

According to the direction of the DOE-HQ GTRI PMP, all participating laboratories are required to post the awarded contract information (statements of work and signed task orders) on the G2 Management System. Documents containing classified information cannot be posted to the G2. Information contained within G2 is considered originator controlled and for official use only (OUO). Authorized users of the system may use the posted information within the scope of their official duties. However, the information may not be extracted, copied, or redistributed outside of NA-21 without permission of the DOE-HQ project manager.

The contracts administrator will forward the awarded signed subcontracts to the PNNL GTRI administrator to be entered into the G2. The signed subcontracts must be posted to G2 within two weeks of receipt of the signed subcontract.

Any PNNL-contracted deliverables received will be reviewed and authorized by the PNNL PM or TOR and released for payment if deliverable and invoice are accurate and complete. The TOR will approve invoices electronically, which will return them to the contracting officer for processing by accounts payable. Completed contract deliverables must be posted to G2 within two weeks of receipt and approval.

6.2 Monthly Financial Status Reporting

The program financial specialist is required to prepare and submit an element of cost report on all projects funded through NA-21 to the DOE-HQ budget officer by the tenth working day of each month addressing costs, amount accrued, and commitments through the previous month. All cost and commitment information shall be provided using cumulative FY data reported by the laboratories to DOE-HQ each month. Refer to the DOE-HQ GTRI PMP for additional information on cost reporting requirements. The report summarizes total cumulative cost and commitments of each project and breaks the cost out into the following cost and commitment elements:

- laboratory labor
- laboratory travel
- laboratory equipment
- laboratory contract costs (unburdened)
- laboratory contract fees
- laboratory unburdened commitment
- laboratory commitment overhead
- Standard Accounting and Reporting System (STARS)-allowed indirect commitment.

Commitments represent the amounts of procurements placed, contracts awarded, services received, and similar transactions that will require payment of funds. The laboratory unburdened commitment

element in the financial monthly reports should contain only the *total unpaid portion of all commitments through the reporting period*. *Commitments for contracts that are either in the planning or formative stages* ***should not be reported until the contract has been awarded***. Laboratory commitment overhead represents the estimated laboratory fees on the unpaid portion of awarded contracts. STARS-allowed indirect encumbrances are all additional fees reported in STARS above the burdened commitment amount.

6.3 U.S. HPRR Monthly Schedule Status Reporting

Monthly, the DOE-HQ management support staff issues a cost and schedule status request to all laboratories. For the schedule, this request is to provide start dates, percent complete, and finish dates for in-progress and upcoming schedule activities. It is issued the last week of every calendar month and input is due on the second working day of the next month. For activities projecting to be complete after the baseline finish date, a variance explanation is required. Once all data has been collected from each performer (usually by the tenth working day of the month), it is uploaded to G2.

The U.S. HPRR SharePoint site is a vehicle for requesting and reporting cost and schedule status. A monthly report providing the overall status of the program will be issued to the DOE-HQ client by the fifth working day of each month.

7.0 Change Control

The project work packages are considered living documents, and the project will update as work scope, schedule, and budget changes necessitate. Generally, project changes fall within the three levels listed below.

- Project manager-approved change
  - These administrative or other changes within the project's tasks do not materially impact the project baseline, project risk profile, or electronic prep and risk (EPR) risk mitigation permit. Such changes will be approved by both the task leaders and the PM.
- PMO-approved change
  - These changes affect documents previously approved by the PMO (e.g., PMP or EPR risk mitigation permit) and PNNL GTRI Convert program manager. Such changes include technical performance, quality of products or services, and discoveries of new risks. PMO-approved changes do not materially impact the customer-approved project baseline thresholds or contract terms and conditions. These internal changes will be approved by the PM, program manager, and PMO. These changes often include revisions to internal milestones or deliverables, the technical approach, risk mitigation actions, etc. These changes will be identified and documented by the PM in the PMP and/or the EPR system.
- Customer-approved change
  - These changes affect the customer-approved program baseline and/or contract terms and conditions or are requested by the customer. The PMO and PNNL GTRI Convert program manager will concur with these changes, and they will be approved by the customer through a revised project work authorization. Once approved, the PM will incorporate the change in the PMP and the EPR system.

Any change identified that requires funding/budget changes or updates to activity scope or deliverables listed in the approved project documentation will be coordinated and approved through the PM and client. The PM will coordinate all proposed changes with affected individuals and organizations prior to implementation, including work performed by other laboratories. Approved changes will be documented and maintained in the project files and if applicable will initiate updates to EPR, risk determination matrix, PMP, and project task sheets per the approach listed above.

Changes should not be implemented simply because activities cost more or less than planned or schedule dates have been missed. The PMs will work closely with the program management and/or financial specialist to determine when it is appropriate to implement changes to the project documentation.

7.1 U.S. HPRR Baseline Change Control

Baseline change control consists of establishing a PMB and maintaining the baseline to make sure that it accurately reflects current program planning. The U.S. HPRR Conversion Program PMB will define the cost, schedule, and scope commitment to which GTRI will execute the program and measure performance. A PMB results from a defined scope, resource loaded schedules, and a cost estimate for the

entire program. It is important to note that U.S. HPRR PMB is an integrated summary level baseline that integrates the details from nine national laboratories, five reactor stakeholders, and the primary fuel fabricator. It is expected that each laboratory and key stakeholders have developed their own lower level resource loaded schedule prior to submitting schedule and cost information to be included in the integrated schedule.

GTRI and the U.S. HPRR Conversion Program have established formal change control process that documents, reviews, and formally dispositions all PMB changes. Changes are presented in a form that clearly defines and validates the driver (cause) of the change and assesses all impacts (effects). All changes to the PMB are formally requested, documented, approved, and maintained using the baseline change control procedure.

The following is a summary of the baseline change control process. At any time, any project participant can request that changes be made to the PMB. Changes are documented on the BCR page of the U.S. HPRR SharePoint site. The following information is recorded for each proposed change:

- log number
- log date
- originator's organization
- WBS number – title
- BCR title
- BCR description
- reasons for change/impacts if not changed
- is it a scope impact?
- is it a budget impact?
- Is a FinPlan change required?
    - If "Yes" then identify where funds are recommended to come from G2 WBS/Lab and where they need to be moved to G2 WBS/Lab
    - If "No" but funding is coming from another source that detail should be discussed in the BCR description above
- pillar lead approval and date
- PMI approval and date
- GTRI Convert DOE-HQ Program Manager approval and date
- date changes have been incorporated into the PMB
- attachments (any supporting information to help define scope, logic, or budget changes).

After submittal of a BCR, the pillar lead and the PMI will review the details to make sure that sufficient information has been provided to effectively make changes to the PMB. Once a month—normally the first week of each month—a change control board consisting of the DOE-HQ Convert

program manager, the pillar leads, and the PMI review each of the proposed changes and make decisions as to whether to proceed with the proposed changes. If a change is agreed to, the PNNL project management support team will make the necessary changes to budget and schedule as well as any scope documentation that may have changed. After initial changes have been made, the modifications are discussed and reviewed with the responsible pillar lead before the change is considered final.

Some, but not all, BCRs generated require funding changes. If the BCR is requesting new funding or is proposing that funding be moved between laboratories, then a financial plan (FinPlan) change request is required. Those BCRs that meet these criteria are submitted for approval at the monthly GTRI Convert FinPlan change meeting, which is normally scheduled for the last week of the month. If approved, a formal FinPlan change is submitted by the GTRI Convert program manager in G2.

7.2 Mo-99 Baseline Change Control

The project work packages are considered living documents that the project will update as work scope, schedule, and budget changes necessitate. Generally, any change identified that requires funding/budget changes or updates to activity scope or deliverables listed in the approved project documentation will be coordinated and approved through the PM and client. Approved changes will be documented and maintained in the work package and project BCR log, and could necessitate updates to the EPR, risk determination matrix, and PMP.

Baseline change control consists of establishing a PMB and maintaining the baseline to make sure that it accurately reflects current project planning. The Mo-99 Project PMB defines the scope, schedule, and cost commitment to which GTRI Convert will execute the Mo-99 Project and measure performance.

The Mo-99 Project has a formal change control process that documents, reviews, and formally dispositions all PMB changes. Changes are tracked in a change log that clearly defines and validates the driver (cause) of the change and assesses all impacts (effects). All changes to the PMB will be formally requested, documented, approved, and maintained using the baseline change control procedure.

Baseline changes at the summary-level WBS (G2 level) require formal authorization by the GTRI assistant deputy administrator through the GTRI Program BCR and FinPlan process. Types of baseline changes include:

- execution year funding changes
- baseline schedule changes
- baseline scope changes
- baseline metric changes.

Baseline changes at the PNNL detailed-level WBS will be documented using the baseline change control log. Change requests will be reviewed, validated, and approved by the PM and procurement officials. Changes to the PNNL work package are managed through a resubmission of the work package for review, validation, and approval by the GTRI Convert program manager.

8.0 Quality Assurance and Control

In addition to the DOE-HQ QA plan and those actions prescribed in the Project Execution Plan (U.S. Department of Energy 2013), the Characterization project issued and is executing to a QA plan, which prescribes the QA approach and quality control (QC) activities.

The Characterization Project QA plan provides a graded approach recognizing that only some of the prescribed scope is quality-effecting. Specifically, the information that may be reported and used as part of the base fuel qualification by the NRC will be subject to applicable provisions of ASME NQA-1-2000. All other work (other than base fuel qualification) is included in the QA plan; however, QA controls will be applied at the discretion of the PM to the extent necessary to mitigate cost and schedule risk.

The PNNL GTRI Convert program manager will make sure that staff members conduct their project activities in a manner to be sure of the integrity, repeatability, and customer satisfaction with project products/solutions, services, and processes. Project staff will provide the level of detail in analyses, documentation, and actions necessary to comply with project quality requirements and the customer's expectations commensurate with the laboratory's QA program.

The Fuel Thermo-Physical Characterization Project QA plan implements the laboratory's QA program through HDI's management system (https://hdi.pnl.gov/standard/5q/5q00t010.htm).

The key areas of the QA plan include but are not limited to:

- identifying and controlling items and materials affecting scientific or design results
- using equipment of known accuracy for process monitoring and data collection
- documenting calculations, analyses, tests, and software required to substantiate results and processes used to develop products/solutions
- maintaining records of documentation necessary to substantiate results and processes of project activities.

The thermo-physical property examination scope of this project is conducted according to applicable ASME NQA-1 standards because the results of this work could be referenced in a NRC NUREG and/or specific research/test reactor SARs. Depending on the extent of the alternate fuel design output, such as drawings and specifications, may have to be delivered to the client. Control of measuring and test equipment may require calibration to NIST traceable standards. The PM and QA engineer will plan strategic performance of QA surveillances to be sure of early detection of quality issues. These surveillances are expected to be performed:

- prior to issuing major procurements (>$100,000)
- prior to or concurrent with issuance of project procedures
- during first use of a quality effecting procedure
- during ad-hoc surveillances at the discretion of the PM.

All work other than the thermo-physical property examination of post irradiated fuel is considered for information only. This work is not necessarily subject to NQA-1, but is covered in the overall QA plan.

Typically, this work is subject to peer review and release through the laboratory's Electronic Records and Information Architecture (ERICA) system.

8.1 Software Use in Analysis

It is possible that a finite element analysis code, such as COMSOL, may be utilized to model and verify results obtained during execution of program projects. A multiple-polynomial regression code, such as that available in Excel™, may also be utilized to analyze and interpret results obtained during execution of this work. Software specific to microscopes in both RPL and 3410 will be utilized to capture and analyze images of the fuel samples. A quality assurance plan will either qualify the program to support the conclusion or provide alternate design verification (alternate calculations, peer review, testing). This plan will be reviewed by the PNNL software QA subject matter expert.

Appendix A of this PMP defines the quality assurance-related requirements and activities that will be followed during the course of software development and deployment on this project.

9.0 Risk Management

All work will be performed in accordance with applicable requirements defined in HDI. Project risks were initially evaluated using the EPR assessment tool and the risk determination matrix system. The risk determination matrices (RDA) for projects 62501 and 63240/63644 are included in Appendix B. Project 64154 has had it's EPR updated recently (April 2013) and the RDA form is no longer being utilized, therefore, review of the 64154 risks will have to be obtained by going directly to the 64154 EPR., A further assessment and evaluation of risks is taken using a graded approach to the following risk process (Figure 9.1).

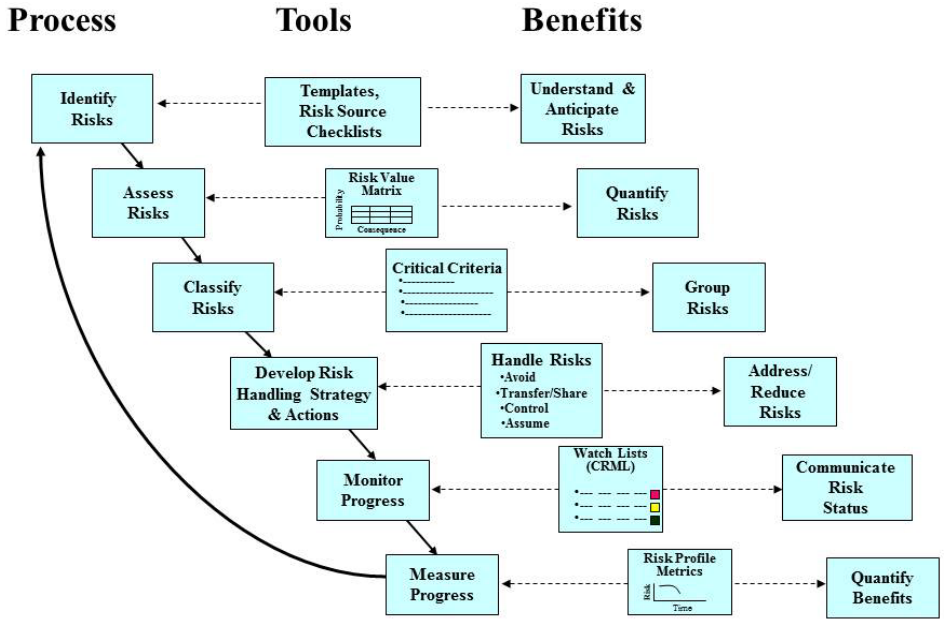

Figure 9.1. Risk Management

The following is a general discussion of various high level GTRI Convert risks by risk category. Detailed information on the six most significant risks is provided in the risk register that follows in Section 9.8.

9.1 Technical Risk

9.1.1 Sample Receipt

The success of the projects under this program is dependent upon receipt of samples from other laboratories. Failure to receive the material could prevent completion of planned work. If planned work cannot be completed, the consequences are three-fold: 1) delay in completion of the work—if individual tasks are on critical path for the program, then the schedule delay can impact overall success at the national level, 2) inability to perform the work can result in an increase in FY carryover and increased cost to complete the work in future years, and 3) inability to perform the work also impacts the availability of staff and facility resources that could be redeployed for other funded work.

In order to minimize this risk, the FFC NTL will establish periodic communications with the external collaborators to convey the critical path as determined by the PM. Projected or actual schedule slippage outside of parameters noted in Section 2.8 that are directly caused by delay in deliverable of samples will be elevated through the PMO director and NA-21 account manager for appropriate action with the DOE client or other laboratory management.

9.1.2 Experimental Work

The Fuel Thermo-Physical Characterization Project will perform out-of-pile characterization of both unirradiated and irradiated fuel samples, and the Foil Rolling Optimization Project will perform process development studies as well as performing out-of-pile characterization of unirradiated fuel samples. These activities involve operation of specific test equipment and working with radioactive materials. The project will utilize the new hot cells in the RPL basement; it is likely that conducting this work will require some minor facility modifications associated with those cells. The projects will also utilize equipment in the 3410 and APEL facilities. Samples for use on these projects will be shipped from different laboratories to PNNL. For some cases involving unirradiated fuel only, it may be necessary to transfer material from one PNNL facility (e.g., 3410) to another PNNL facility (e.g., RPL). Radioactive mixed waste will consist of both solid and liquid forms as a result of the multiple sample preparation and characterization processes, and will be properly disposed of at the completion of the projects. All work will be performed in accordance with both the ES&H policies and procedures described in HDI management systems description and specific workspace IOPs protocols.

9.2 Significant and/or Complex Capital Expenditures

The B&W Contracting Project involves the procurement of services and equipment for B&W NOG-L. These procurements are anticipated to total in the tens of millions over the lifecycle of the project. If these contracts cannot be placed with B&W NOG-L, the three-fold consequences identified in Section 9.1.1 will be realized.

In order to minimize this risk, senior and experienced PNNL contracts personnel are assigned to contracts managed under this project. The technical administrator for the contracts is TOR-3 certified with significant construction management experience. Project controls personnel at the U.S. HPRR level will assist with deliverables tracking.

9.3 Receipt of Funding During the FY

Delays in receipt of funding, especially early in the FY, may delay the start of work or establishment of new contracts if laboratory expenses and contractually committed funds exceed the amount of uncommitted carryover. If the availability of adequate resources is scope limited, then the three-fold consequences identified in Section 9.1.1 will be realized—especially in the case of large contractual commitments. GTRI requires no more than an annually specified uncommitted carryover from one FY to the next, which contributes to this risk. In order to minimize this risk, PNNL GTRI Convert projects produce a spend forecast and spending plan by which the uncommitted carryover is tracked.

9.4 Price Anderson Amendments Act

Project scope will address characterization of U-Mo alloy fuels for use in research and test reactors. Characterization activities will be performed on both unirradiated and irradiated fuel samples. Large irradiated samples will be limited to hot cells and shielded analytical laboratory cells. Smaller samples (thereby limiting dose) will be utilized for work in the shielded modular hot cells, shielded glove boxes, and/or microscopes. For unirradiated fuel samples, preparation activities that could create exposure will be conducted in fume hoods and/or glove boxes. All efforts will be performed in accordance with workspace IOPs procedures and controls.

9.5 Foreign Travel

There occasionally may be international travel on the GTRI Convert Program. Work may be presented at international conferences and/or seminars in non-sensitive countries. All foreign travel will be conducted in accordance with PNNL policies on foreign travel. For detailed information relating to foreign travel, see the PNNL GTRI Program Implementation Guidelines Document, dated April 2013.

9.6 Conflict of Interest

PNNL routinely reviews documents and license requests for the NRC. While these reviews are rarely associated with research and test reactors, one of the major deliverables associated with this scope is a correlation that could appear in a NRC NUREG and research and test reactor SARs. Should PNNL be asked to review any information associated with the NUREG or research and test reactor SARs, the participation in this scope should be disclosed.

9.7 Risk Register

The PNNL GTRI Convert Program risk register follows. This is a listing of significant risks to the PNNL Convert Program that clearly states the risk event; provides a contextual explanation of the risk; and includes the impacts should the risk occur, qualitative assessments of the likelihood, consequence, risk value, and the risk handling actions being taken to lessen the likelihood or reduce the consequences of each significant risk.

Table 9.1. PNNL GTRI Convert Program Significant Risks

	Risk	Explanation	Impacts	Likelihood[(a)]	Consequence[(a)]	Risk Value[(a)]	Actions
1.	**Sample receipt** delays could prevent the completion of planned work on the current schedule.	PNNL depends on the receipt of samples from three different locations to accomplish planned work.	• Unable to perform work • Results delayed • Could lose space in PNNL facilities • Critical staff take other work	L	H	M	• Constant communication • Educate customer on impacts • Stress importance of timely shipping • Program based incentives
2.	PNNL may not be able to negotiate additional **key contracts** or garner response to future RFPs.	PNNL GTRI-Convert depends on a sole source provider (B&W) for performing essential work scope. This sole source contracting is very complex and may not be a priority for the sole source provider.	• No "plan B" path forward available so program could be stopped • Work is on a critical path • May not be able to use annual funds	L	H	M	• Educate customer on impacts • Careful relationship management • Use "A" team for contracting and TOR • Be willing to pay high G&A
3.	Extensive **funding delays** due to CR could inhibit completion of current year work scope, especially front loaded major contracts.	PNNL/DOE is again operating under a continuing resolution. Sufficient funds may not be available for major contracts needed early in the FY.	• Work is delayed	M	M	M	• Utilize limited carry-over efficiently • Look ahead and plan to move money to accomplish key work as required • Leverage overall program funding utilizing the flexibility afforded during the CR to supplement funding for early-FY priority activities.

Table 9.1. (contd)

	Risk	Explanation	Impacts	Likelihood[(a)]	Consequence[(a)]	Risk Value[(a)]	Actions
4.	Nuclear operational incidents could lead to **facility shutdowns**.	PNNL is conducting key work in multiple radiological facilities with fresh and irradiated fuel. PNNL has an excellent track record with operational safety performance and a history of no shutdowns.	• PNNL could not complete promised work • Results delayed • Loss of work to other labs	L	H	M	• Meticulous attention to IOPs and ES&H procedures • Constant communication
5.	Planned **technical approach** for work may not be successful.	PNNL's planned work with specialized scientific equipment, analysis processes, data collection methods, and sample sectioning could prove unsuccessful.	• Work is delayed • PNNL's reputation suffers • Loss of work to other Labs	L	H	M	• Keep experts fully engaged • Conduct periodic reviews and refine approaches, as required • Maintain constant communication with all parties and client • Manage customer relations • Document results, capture learning
6.	Critical **key staff** might leave the program and/or the Laboratory.	GTRI-Convert depends on a few highly knowledgeable and capable staff for success.	• Loss of client respect • Inability to successfully manage and complete work • Loss of work scope	L	H	M	• Ensure internal communications are clear and frequent • Acknowledge and appreciate high performance • Reward high achievers

Note: HQ Program risks Mo-99 IRE contract quality performance and risks of baseline fuel design being too expensive are not included in PNNL GTRI Convert Program risks.

(a). L = Low; M = Moderate; H = High

10.0 Communications

10.1 Internal Communications

All communications at the program level conducted on PNNL's behalf should be conducted through the PNNL GTRI Convert program manager. All funds management questions should be coordinated through the PNNL GTRI financial specialist.

The PNNL GTRI operations manager and the PNNL GTRI Convert program manager will make available programmatic guidance and information that will be valuable for program participants to access and use. Each team member is given access to the PNNL GTRI R Drive (network share drive), which contains PWP documentation, financial and funding information, organization charts, contracts, deliverables and their approvals, and approved invoices.

10.2 External Communications

Adherence to the chain-of-command is required of all PNNL GTRI personnel. This particularly applies to communication and correspondence with external domestic and foreign organizations as well as communications with NNSA HQ. All technical reports developed need to be submitted through ERICA and reviewed by an Authorized Derivative Classifier (ADC). None of these technical reports are to be released to external organizations without the PNNL GTRI Convert program manager and DOE-HQ Convert Program Manager's approval.

Note: Because of the multi-laboratory nature of the convert work the DOE-HQ project management integration activities on U.S. HPRR, Mo-99 and TREAT which are all project management scope, cost and schedule details, the DOE-HQ customer is aware of and expects regular daily communication with the project participants without any need for prior authorization from DOE-HQ. The FFC NTL role which is staffed by a PNNL manager, is not to be restricted from communications with other laboratory program participants either via email or verbal communications. However, if a technical report is generated as part of the PNNL scope of the project it must be submitted the applicable ERICA and ADC reviews.

10.3 Information Release

Given the importance of information control to security, all PNNL staff members are expected to follow the laboratory's information release (IR) requirements for all materials being shared external to PNNL. The responsible author or delegate completes the electronic IR form in ERICA as instructed. Once the IR process is complete, an IR number will be provided that should be placed on information shared outside the laboratory, including formal reports, exhibits, or posters at trade shows; presentations and posters at conferences; journal articles; brochures or fliers; books or book chapters; conference presentations or papers; speeches; and videos. **Remember to include PMO-70 in the review/approval of the ERICA submittal.**

10.4 Handling Official Use Only Information

The DOE-HQ prepares and maintains certain unclassified information that should be protected because of sensitive governmental, commercial, or private interests. Such information is known as OUO information.

To be eligible to be identified as OUO, unclassified information must:

- have the potential to damage governmental, commercial, or private interests if disseminated to persons who do not need the information to perform their jobs or other DOE-authorized activities
- fall under one of eight Freedom of Information Act exemptions (Exemptions 2 through 9).

DOE guidance addressing the marking and handling of OUO information is provided under DOE Order 471.3 and associated guides and manuals as follows:

- DOE Order 471.3, *Identifying and Protecting Official Use Only Information*, which contains requirements and responsibilities
- DOE Manual 471.3-1, *Manual for Identifying and Protecting Official Use Only Information*, which provides instructions for implementing requirements
- DOE Guide 471.3-1, *Guide to Identifying Official Use Only Information*, which provides information to assist someone in deciding whether information could be OUO.

These directives apply to all DOE and NNSA elements that 1) identify information under their cognizance as OUO and mark documents accordingly, or 2) possess documents marked as OUO by other DOE elements or marked with other-agency markings equivalent to OUO (e.g., the U.S. Department of Defense's and U.S. Department of Homeland Security's "for official use only" and the U.S. Department of State's "sensitive but unclassified").

11.0 Training and Qualifications

11.1 Foreign Travel Training

Staff and U.S. subcontractors who travel to a foreign country or travel between foreign countries will be required to attend the foreign travel briefing (course 1510). PNNL non-staff whose salaries and/or travel expenses will ultimately be funded in whole or in part by PNNL clients are also required to attend this training. This course must be repeated every three years. Additional information can be found in the HDI subject area https://hdi.pnl.gov/private/standard/04/0400t010.htm.

11.2 RPL Access Training

Staff requiring specific access to RPL must complete RPL orientation and all hazard related training determined by the *RPL Training Implementation Plan* (Pereira 2013).

11.3 Radiological Worker I

Radiological worker 1 is the minimum qualification level required for staff handling radioactive materials. Personnel actively participating in movements of PNNL radioactive materials will be qualified to a minimum of GERT and wear a DOELAP accredited dosimeter.

12.0 Records Management

The PNNL GTRI administrator is responsible for maintaining the Records Inventory and Disposition Schedule (RIDS) for all records on the PNNL GTRI Convert Program. The RIDS will clearly delineate hard copy (paper) files from electronic files and will identify a location and custodian for each record. A central location will be identified for the storage and retrieval of each record format. The RIDS should describe any records that are stored at other national laboratories. Project records should reflect changes in custodians and be transferred to that appropriate custodian when staffing changes occur.

Each PNNL GTRI Convert Program project team member is responsible for managing and retaining project records. Responsibilities for records will vary, depending on whether PNNL is the lead laboratory and the role of each team member on the project, and will be managed in accordance with DOE guidelines and HDI management system description, records management program.

Most program records will be stored on an internal PNNL server, commonly referred to as the R drive. Records will transferred to TRIM on a periodic basis in accordance with the RIDS.

13.0 Oversight Activities

The CBNS PMO may schedule program or project reviews for PNNL projects that will potentially include representatives from DOE's Pacific Northwest Site Office and also NSD subject matter experts. The reviews will be scheduled with the PNNL GTRI Convert program manager. The NA-21 account manager will also be invited to attend, as well as the project control specialist, program financial specialist, and any other key staff, such as primary technical contributors. The focus of this review is to make sure that the project is meeting the laboratory's project management requirements, delivering quality and timely products to the client's satisfaction, and documenting projects risks and the approaches to mitigate those risks.

In addition, the GTRI Convert program manager or delegate will conduct management assessments of internal project and subcontractor processes as required to be sure of successful completion of the program's projects.

14.0 Project Closeout

Project closeout is the final phase of a project's lifecycle. Closeout will occur after all contractual obligations, products, services, and deliverables have been completed and accepted by the client and final payment has been received. All commitments, invalids, p-card costs, and any other outstanding financial issues will be resolved before PNNL closes a project. The PNNL GTRI Convert program manager will make sure that there is adequate funding for closing out all project files, confirm that closeout tasks are completed (e.g., contract obligations closed out, equipment returned to the client or transferred project approved by client, intellectual property identified, vendors and subcontractors notified, and waste dispositioned), and records are submitted to storage or transferred to follow-on project.

The EPR closeout checklist will be completed and signed off by the PM in accordance with HDI. See the close project workflow section of HDI.

15.0 References

Global Threat Reduction Initiative (GTRI), PNNL Program Implementation Guidelines, National Nuclear Security Administration (NNSA) Sector, Office of Global Threat Reduction (NA-21) Account, April 2013

Pereira M. 2013. *RPL Training Plan for GTRI Project*. Pacific Northwest National Laboratory, Richland, Washington.

Pereira M and BD Slonecker. 2012. *Global Threat Reduction Initiative Fuel Thermo-Physical Characterization Project Quality Assurance Plan*. Pacific Northwest National Laboratory, Richland, Washington.

Pereira MM. 2012. *Global Threat Reduction Initiative Fuel Thermo-Physical Characterization Project* 62501 *Project Execution Plan*. Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy and National Nuclear Security Administration. 2013. *Global Threat Reduction Initiative U.S. High Performance Research Reactor Conversion Program Functions and Requirements, Rev. 0.*

U.S. Department of Energy and National Nuclear Security Administration. 2013. *Global Threat Reduction Initiative U.S. High Performance Research Reactor Conversion Program GTRI Convert Work Packages FY 2013, Rev. 0.*

U.S. Department of Energy and National Nuclear Security Administration. 2013. *Global Threat Reduction Initiative U.S. High Performance Research Reactor Conversion Program Project Execution Plan, Rev. 0.*

U.S. Department of Energy and National Nuclear Security Administration. 2013. *Global Threat Reduction Initiative U.S. High Performance Research Reactor Conversion Program Quality Assurance Program Document, Rev. 0.*

U.S. Department of Energy and National Nuclear Security Administration. 2013. *Global Threat Reduction Initiative U.S. High Performance Research Reactor Conversion Program Risk Management Plan, Rev. 0.*

U.S. Department of Energy and National Nuclear Security Administration. 2013. *Global Threat Reduction Initiative U.S. High Performance Research Reactor Conversion Program Scope Document, Rev. 0.*

Appendix A

Software Quality Planning

Appendix A

Software Quality Planning

This plan defines the quality assurance activities and identifies the documentation that will be created and maintained during the entire software engineering process. The purpose of this appendix is to provide adequate confidence that the software development process is controlled, and that the software products will meet established requirements.

Table A.1. Software Quality Planning

Software Development (Grade C)			Completed By:	Date:
Grading C			Kary Cook	01/09/2013
Complexity	Size	Requirements Definition	Failure Impact	Grade Level
Not Complex	Not Large	Well Defined	Low	C
Software Description/Intended Use				
Abaqus 6.11 and LS-Dyna will be utilized for this project. These are commercial Finite Element codes, developed by LSTC software and Dassault Systems respectively. LS-Dyna does the core of the work but does not have powerful tools to do pre-processing work so Abaqus is used for this. Simulations (models) are conducted by LS-Dyna and results are compared/validated with experimental data. Parametric study is conducted for process optimization. Existing subroutines are being utilized for material behavior in the models. Use the finite element model as a tool to optimize the process parameters of the existing roll-bond process steps in order to improve the yield, and possibly performance, without adding or eliminating any of the process steps. Parametric studies are performed on rolls diameter, can material … etc. The results will give guidance to the client (DOE/NNSA) for a manufacturing process. Reputation would be affected if models are incorrect; result would be that PNNL won't get any follow-on funding.				
Requirements for Level C Software		How the project meets the requirements		
Planning				
Document the software grading		Grading and documentation of grading are provided in the above table.		
Software Requirements				
Document the software requirements.		Abaqus 6.11 is used for pre-processing (create the geometry of the models and meshing). Models are then exported into LS-Dyna for running the analysis/simulations. The version of the LS-Dyna solver used for the simulations is ls971_d_R6. Post-processing analysis is conducted using LS-prepost (a module of LS-Dyna provided by LSTC).		
Design				
Document the design.		Not required for level C		
Coding Standards				
Document the coding standards used.		Not required for level C		

Table A.1. (contd)

Software Testing	
1. Plan and document summary-level test methods. 2. Document test results for software and support software. 3. Document evaluation of test results.	For validation, the model will be run and predictions will be compared with experimental data. Parametric study will be then conducted in order to optimize the existing process. Results are a deliverable to the client in reports and publications in peer review journals form with supporting verification documentation.
Reviews	
1. If software is released externally, follow the Information Release process.	N/A
Configuration Management	
1. If Lab Operations software, enter or update in the IRI. 2. Maintain configuration items under CM. 3. Release the software with a unique identifier.	No software development will occur.

Appendix B

Risk Determination Matrices

Appendix B

Risk Determination Matrices

Table B.1. Risk Determination Matrix for GTRI Conversion Program Capital Equipment Procurement

	Project # 63240	PM: Scott Maple	Project Title: GTRI Conversion Program Capital Equipment Procurement			
The overall risk determination is low. The detailed determination matrix below provides information on each consideration.						
Specific Risks		**Risk Characteristics and Levels that Define the Project Risk Profile**			**choose**	**Risk Mitigation (Comments Required)**
		Low Risk	**Medium Risk**	**High Risk**	**H/M/L**	
Technical Considerations						
	Scientific / Technical Approach	**Proven and straightforward technical approach**	New technical approach or a known approach, but limited experience at Lab Approach involves new software as an essential tool	Leading-edge or complex technical approach that may be controversial	L	Technologies are well understood and mature.
	Technology Maturity (lifecycle stage, e.g., basic science, applied research, engineering, etc.)	**Within single lifecycle stage**	Transitioning from basic/applied research to demonstration and/or deployment	Transitioning or work is within multiple lifecycle stages leading to commercialization	L	Not Applicable
	Experience / Capability of PM	PM has experience successfully managing similar projects	**PM has some experience managing similar projects**	PM has limited experience managing similar projects	M	PM has experience with procurements greater than $1 mil. Capital equipment management is a new responsibility to manage. Roles and responsibilities are driven primarily by HDI requirements of a Technical Administrator.

	Technical Experience / Capability of PI and Staff	**PI and project staff have routinely conducted similar technical work**	PI and project staff have some experience with technical approach	PI and project staff lack some necessary experience and capabilities	L	Technical background of PI is in the sbuject area of nuclear operations.
	Resource Availability	**- Single-PI project or plenty of staff available** **- Equipment and labs are readily available**	Potential for missing expertise or unavailable resources (staff, equipment or labs)	Likely to have missing expertise or unavailable resources (staff, equipment or labs)	L	Existing Project Management, project controls, contracts, and quality assurance personnel are available, and will remain available as required.
	Internal and External Interfaces	**Small project team, with no external collaborators**	Multi-directorate project team and/or long-term external collaborators)	Large, multidisciplinary team and/or new or complex external collaborations	L	Uses small teams including subcontractors to address clearly defined work scope.
Customer Considerations						
	Customer Familiarity	**Customer is satisfied with past work, expects continued success, and works with us if project issues arise**	Good experience with customer, but customer is demanding and has high expectations	New customer or poor past performance with existing, demanding customer	L	Project has good customer relations.
	Customer Stability and Involvement	**- Funding and requesting customer are the same** **- Customer representatives) expected to remain the same throughout the project** **- Customer involvement is limited to normal reporting**	- Funding and requesting customers are different and may not be well coordinated - Customer representatives could change during the project - Customer plans to conduct routine informal project performance reviews	Project has multiple funding customers Customer plans to conduct one or more of the following: - Formal project performance reviews - Project milestone reviews, e.g., design reviews, readiness reviews, etc. - External peer review	L	Stable client who understands requirement of a capital equipment procurement.
	Project Scope	**Well-defined scope and requirements**	Scope generally defined, and further evolution in scope is expected	Project involves working with customer to actually define the requirements for products during the project. Customer likely to request scope change.	L	Project scope is well defined and documented.

	Project Funding	**- Sufficient budget** **- Funds are coming through DOE Fin Plan** **- Upfront payment for work**	- Normal challenging budget - Project has multiple funding sources	- The customer perceives the project to be fixed price - Complex cash flows can impact our ability to spend	L	Well defined, documented and managed budget; work scope is appropriate for budget provided.
	Project Schedule	**- Sufficient time available for work** **- Open-ended, basic research**	Normally challenging schedule with milestones and fixed completion date	- Very tight schedule, especially with respect to the budget - Our failure to deliver would impact important customer milestones - Customer requires us to use an earned value project management approach	L	The overall project schedule for the Fuel Fabrication Capabaility has challenges, but the limited scope the procurement of 2 items of capital equipment is not a delivery challenge.
	Customer Use of Results	**- Basic science contribution to knowledge** **- Limited impact on customer's business**	Project results have tactical impact on customer's business or decisions	Project results could: - Have strategic impact on customer's business decisions, ongoing research programs, or business - Make the customer a future competitor - Be involved in litigation - Be used in a high-risk application Project results will be used by the customer in a high-risk environment, such as nuclear or radiological applications, public safety, or national defense	L	No impact expected.
	Political Visibility	**None**	Project or results are anticipated to have some political visibility that could impact PNWD	Project or results have high political visibility and interest as part of customer's program or as a standalone project	L	Not a politically visible procurement.

	Public Concern	**None**	Public may have some concerns over the project or results	- Significant public concern with the conduct of the project or it results is expected - The project's scope requires public involvement	L	Not a pblic concern.
Contractual Considerations						
	Type of Contract	**1830 Contract**	-1831 Government / WFO - 1831 Industrial - Grant	1831 Industrial - performance-based	L	1830 Contract
	Contract Complexity (required collaborators, cost and fee bases, corporate exemptions**)**	No collaborators, cost reimbursement	**Time and materials, external collaborators, fee within fee guidelines**	Fixed-price contract, fee tied to deliverables, multiple external collaborators, fee lower than guidelines	M	Sole source contracts the will be firm fixed price. Senior contacts staff are engaged in the procurement.
	Intellectual Property	**No IP involved in the project**	PNWD owns the IP that is the basis for the project. Project does not generate new IP	- Project relies on externally-owned IP - Project creates new IP, which might also be shared with customer - IP is particularly valuable	L	No IP on this project.
	Acquisitions and subcontracts	None or limited to simple P-Card or B2B procurements	**- Requires the use of formal purchase requisitions to acquire services or off-the-shelf products from known vendors** **- Involves modest capital expenditures**	- Project depends on delivery of specialty products or products from vendors with little PNWD history - Project success depends substantially on delivery of product or services from others - Involves significant and/or complex capital expenditures	M	The project uses a dedicated and mature staff under the direction of a senior Contract Specialist to mitigate this risk and ensure compliance with requirements.

Quality Assurance						
	Customer Specifies QA Requirements or Standard	None	Customer has some specific QA requirements and - Staff are experienced with needed QA - Minimal effort required (e.g., special records or use of existing analytical QA plan) - Customer reserves right to conduct QA audit	**Customer has significant and/or complex QA requirements** **- For example, NQA-1, HASQARD, NUQARD** **- Customer has specific configuration-control requirements** **- Staff have limited QA experience, relative to requirements**	H	NQA-1 and 10CFR50 requirements apply for this equipment that will be used for nuclear fuel processing. PNNL QA SME's will be engaged in vendor audits and deliverable reviews.
	Customer Regulatory Involvement (Project provides direct regulatory support or customer will use the results in a regulated environment)	Results will not be used in a heavily regulated environment (EPA permits, environmental cleanup, operating licenses, etc.)	Results may be subject to regulatory scrutiny or are supporting agency rulemaking activities	**Customer will use results in a regulatory action (e.g., NEPA, license application, DOE Safety Class application, etc.) or in a highly regulated application**	H	NRC requirements for nuclear fuel production will be addressed by the vendor as required by a statement of work.
	Deliverables - Written	**- Non-controversial basic research results published in journals** **- White papers** **- Routine technical reports**	Written deliverables contain: - Data or conclusions that can impact customer actions - Results that are from non-routine technical approaches - Results that may be controversial	- Sensitive data or recommendations - Results feed into a highly sensitive environment - Results support a product that must function in a highly reliable manner	L	Written deliverables are documentation of basic requirements of equipment acceptance.
	Deliverables - Software	**- No software is delivered to the customer or research community** **- Existing, proven software is used to support the research**	Software delivered to customer or research community that is not categorized as Safety Software or will not be used in sensitive applications	- Software categorized as "Safety Software" - Software that will be used by customer for sensitive activities (security, intelligence analyses, etc.	L	No software is provided

	Deliverable - Hardware	No hardware is delivered to customer or research community	Hardware is developed for customer use in a normal industrial or conventional environment	**Hardware is developed for customer use in a high-risk environment, such as nuclear or radiological applications, public safety, or national defense**	H	All of the equipment being used is commercially available off-the-shelf equipment.
Operational Considerations						
	Security	**Normal business requirements:** **- USA Business Travel** **- PNWD staff who are foreign nationals with FNVA working on unclassified projects**	Project uses: - Foreign nationals - Sensitive unclassified information - Classified materials with an experienced staff - Controlled substances - International travel - Category IV special nuclear materials	Project uses: - Foreign nationals on unclassified portion of classified project - Category III special nuclear materials - Classified matter and project staff is inexperienced with handling it	L	All PNNL project personnel are US citizens. The vendor is a U.S. company.
	Environment, Safety & Health	No ES&H issues: - Project work is done on-site - No lab work - Project work is all or mostly paper or workstation-based	**Known and manageable ES&H issues:** **- Work performed in integrated operations system (IOPS) spaces** **- Routine, low-risk work offsite, ie, known site, proven access, simple activities** **- Project will generate hazardous, radiological, or mixed waste**	Project involves actions with significant ES&H implications - Large ES&H issues with significant potential risks - ES&H issues are complex - Offsite work with potential ES&H impact - Work with certain biological agents	M	Issues related to visiting facilities that contain nuclear materials are addressed and managed. Specific training is provided. Contained in PMP.
	Special Operational & Regulatory Concerns (Projects requires specific regulatory support, e.g. environmental or transportation issues)	**None**	- Work uses regulated materials and produces regulated wastes and/or sewer discharges - Known and manageable environmental issues (e.g. work permitted in IOPS Spaces) - Work uses radioactive materials	Project involves materials listed under medium risk and requires EA/EIS, permits or notifications (e.g. DOH NOC, RCRA permit), license revision, etc.	L	No opeartional concerns with the equipment procurement.

	Research Site Access	**Project is within PNWD offices or labs**	Project is at external site for which we have good experience	Project is at new site, multiple sites, or a foreign location	L	This project does not include research. The equipment procurement is the result of enginnering efforts to specify equipment.
	Use of Human or Animal Subjects	**None**	None	- Work involves use of human subjects - Work involves use of animal subjects	L	NO human or animal subjects are used on this project.
	Use of Sealed Sources	**None**	-Work with Type 1 (including sources contained in instruments) or Type 2 Robust Sealed Sources	- Work with Type 2 Fragile Sealed Sources	L	None

Table B.2. Risk Determination Matrix for the NSD Project Management Office

Table B.3. Risk Determination Matrix for NSD Product Line Risk Determination

Project # 62501	**PM: Doug Burkes**	**Project Title: LEU-Mo Fuel Out-of-Pile Characterization for the GTRI**		**Date: 04/10/2013**	**Overall RISK LEVEL: Medium**	
	Instructions: All proposals and projects are now required to have a risk matrix completed by the PM. Please complete this form by following these steps: 1) At the top of the form Insert the project number, title, and after completing the form your assessment of the overall risk level; 2) In the "Choose H/M/L" column, fill in (H)igh, (M)edium, or (L)ow for each risk; 3) most importantly, add comments in the far right column about activities, risks, and plans to mitigate those risks. Once complete, return to the Product Line Manager and/or specialist for review and discussion. Please feel free to contact the PL if you need an example or if you have questions.					
Specific Risks	**Risk Characteristics and Levels that Define the Project Risk Profile**			**Choose**	**Risk and Mitigation Comments Required for M and H**	
	Low Risk	**Medium Risk**	**High Risk**	**H/M/L**		
Technical Considerations						

	Scientific / Technical Approach	Proven and straightforward technical approach	**New technical approach or a known approach, but limited experience at Lab Approach involves new software as an essential tool**	Leading-edge or complex technical approach that may be controversial	m	(Low) Unirradiated OM/scanning electron microscopy(SEM) Examination (AFIP-7)-Bldg 3410 (Low) Unirradiated Surface Examination-RPL (Medium) Thermo-Physical Properties of Irradiated Fuel-RPL Existing equipment will be utilized to perform measurements on irradiated samples which have not previously been performed in hot cells. This includes hot cells that will be used for the first time. This risk is mitigated by ensuring that the project has a sufficient amount of time in mock-up to make all necessary equipment and procedural modifications to perform the characterization work. Procedures will be well-defined for measurements and the equipment and procedures will be validated utilizing surrogate and unirradiated samples before equipment is inserted into the hot cells. The risk is further mitigated by ensuring that well-known/defined samples are provided for measurement and analysis.
	Technology Maturity (lifecycle stage, e.g., basic science, applied research, engineering, etc.)	**Within single lifecycle stage**	Transitioning from basic/applied research to demonstration and/or deployment	Transitioning or work is within multiple lifecycle stages leading to commercialization	L	Known analytical techniquies
	Experience / Capability of PM	**PM has experience successfully managing similar projects**	PM has some experience managing similar projects	PM has limited experience managing similar projects	L	PMP, 20 Years experience, prior hot cell experience, Cat II nuclear facility experience

	Technical Experience / Capability of PI and Staff	**PI and project staff have routinely conducted similar technical work**	PI and project staff have some experience with technical approach	PI and project staff lack some necessary experience and capabilities	L	Previously PI on identical project at INEL. Considered DOE program expert on fuel characterization.
	Resource Availability	- Single-PI project or plenty of staff available - Equipment and labs are readily available	**Potential for missing expertise or unavailable resources (staff, equipment or labs)**	Likely to have missing expertise or unavailable resources (staff, equipment or labs)	M	(Low) Unirradiated OM/SEM Examination (AFIP-7)-Bldg 3410 - 16 to 20 samples (Low) Unirradiated Surface Examination-RPL (Medium) Thermo-Physical Properties of Irradiated Fuel-RPL Due to the number of projects performing work in the RPL , the potential for unavailable resources exists. RPL has an existing planning process for projects. The project will integrate schedule and resource data to ensure faciltiy resources are available. Conflicts between competing projects will be identified early through integrated schedule and PM to PM communications. Unresolved conflicts will be ellevated to the PLM for resolution as early as possible.

	Internal and External Interfaces	Small project team, with no external collaborators	Multi-directorate project team and/or long-term external collaborators)	**Large, multidisciplinary team and/or new or complex external collaborations**	H	(Low) Unirradiated OM/SEM Examination (AFIP-7)-Bldg 3410 (Low) Unirradiated Surface Examination-RPL (High) Thermo-Physical Properties of Irradiated Fuel-RPL This work will involve a multidisciplinary team of procurement, quality assurance, transportation, and technical staff at the RPL and 3410 facilities in order to be successful. In addition, a new "complex" external collaborator in Idaho National Laboratory (the client for this work) will be involved. This risk will be mitigated by the PM interfacing with the multidisciplinary team early and often, and the PI interfacing with the INL to ensure that expectations and timelines are clearly defined and agreed upon. A project plan with an organizational chart, R2A@'s will be issued to the project personnel.
Customer Considerations						
	Customer Familiarity	Customer is satisfied with past work, expects continued success, and works with us if project issues arise	**Good experience with customer, but customer is demanding and has high expectations**	New customer or poor past performance with existing, demanding customer	M	The GTRI customer is very demanding and has high expectations for PNNL to perform this work on time and on budget. The risk is best mitigated by solid, regular communication with the customer by the PI. Furthermore, this risk will be mitigated through the development and execution of a detailed schedule, providing weekly and monthly progress reports, and identifying and reporting any potential issues early.

	Customer Stability and Involvement	- Funding and requesting customer are the same - Customer representatives) expected to remain the same throughout the project - Customer involvement is limited to normal reporting	**- Funding and requesting customers are different and may not be well coordinated** **- Customer representatives could change during the project** **- Customer plans to conduct routine informal project performance reviews**	Project has multiple funding customers Customer plans to conduct one or more of the following: - Formal project performance reviews - Project milestone reviews, e.g., design reviews, readiness reviews, etc. - External peer review	M	The funding for this project is provided directly from the GTRI customer. Material samples will be provided by INL (the client) and analysis will be provided to INL. The coordination between PNNL, the customer, and the client will be maintained through good communication. Discussions with INL regarding material samples (i.e. number and type of samples, transportation logistics, measurement technique, etc.) should occur early in the project. The expectations and assumptions for conducting the work should be identified early in the project and be agreed upon by both PNNL and the client (these should be documented in the PMP). A clear communication plan will be identified in the PMP for both the customer and the client.
	Project Scope	Well-defined scope and requirements	**Scope generally defined, and further evolution in scope is expected**	Project involves working with customer to actually define the requirements for products during the project. Customer likely to request scope change.	M	The scope of the FY 2012 work is generally defined, but scope in the out-years has the potential to evolve and even expand. This risk will be mitigated by informing the customer of work that is outside of the current scope of the project.

	Project Funding	- Sufficient budget - Funds are coming through DOE Fin Plan - Upfront payment for work	**- Normal challenging budget** **- Project has multiple funding sources**	- The customer perceives the project to be fixed price - Complex cash flows can impact our ability to spend	M	The budget for FY 2012 is solid to support this project. However, out-year funding is a risk to the project, since the scope will cross at least one FY. The risk will be mitigated through the solid relations that have been established with both the customer and the client by the PI. Development of a detailed schedule and cost estimate will allow sufficient time to plan for the out-years, and adjust as the budget allows. Transportation costs associated with the irradiated samples is a potentially large risk. The budgetary needs to perform this aspect of the project need to be determined as soon as possible so that adjustments to FY 2013 plans can be made.
	Project Schedule	- Sufficient time available for work - Open-ended, basic research	**Normally challenging schedule with milestones and fixed completion date**	- Very tight schedule, especially with respect to the budget - Our failure to deliver would impact important customer milestones - Customer requires us to use an earned value project management approach	M	The customer is very demanding and has high expectations for PNNL to perform this work. In addition, there are numerous projects that demand resources in both the RPL and 3410 facilities. This risk will be mitigated by developing a detailed, resource loaded schedule and by documenting assumptions for the project that are clearly communicated to both the customer and the INL client. The assumptions will periodically be analyzed and updated as needed.

	Customer Use of Results	- Basic science contribution to knowledge - Limited impact on customer's business	Project results have tactical impact on customer's business or decisions	**Project results could:** **- Have strategic impact on customer's business decisions, ongoing research programs, or business** **- Make the customer a future competitor** **- Be involved in litigation** **- Be used in a high-risk application** **Project results will be used by the customer in a high-risk environment, such as nuclear or radiological applications, public safety, or national defense**	H	The results of this work will potentially be used by the client [and customer] in a report that will form the basis for a NUREG issued by the NRC. This risk will be mitigated by having a clear Quality Assurance plan and approach, and ensure compliance with that plan at all times. Early communication of potentially damaging or "unexpected" results will occur with both the customer and client. The risk will be mitigated by ensuring that high quality technical work is being performed and information is documented properly. The risk will be mitigated by identifying staff with the appropriate set of skills and experience to conduct this work.
	Political Visibility	**None**	Project or results are anticipated to have some political visibility that could impact PNWD	Project or results have high political visibility and interest as part of customer's program or as a standalone project	L	
	Public Concern	**None**	Public may have some concerns over the project or results	- Significant public concern with the conduct of the project or it results is expected - The project's scope requires public involvement	L	
Contractual Considerations						
	Type of Contract	**1830 Contract**	WFO 1831 Government 1831 Industrial - Grant	1831 Industrial - performance-based	L	1830 Related Services for other DOE Sites (INL) Inter-Entitiy Cotnractor Purchase Work Request (formerly IWO)

	Contract Complexity (required collaborators, cost and fee bases, corporate exemptions**)**	No collaborators, cost reimbursement	**Time and materials, external collaborators, fee within fee guidelines**	Fixed-price contract, fee tied to deliverables, multiple external collaborators, fee lower than guidelines	m	This risk is scored not necessarily because of contract complexity, but rather because of external collaborator complexity. -- The scope of this project is dependent upon material samples, both Unirradiated and irradiated that will be supplied by INL. Delays in receipt of the samples will ultimately result in delays associated with deliverables for the customer and client. --This risk will be mitigated by ensuring constant communication and coordination with the customer and client. -The project will establish a baseline schedule including lead time for sample prep and ship by the client. Client underperformance will be offset by negotiated contingency (both schedule float and budgetary), beyond which formal change control will be required.
	Intellectual Property	**No IP involved in the project**	PNWD owns the IP that is the basis for the project. Project does not generate new IP	- Project relies on externally-owned IP - Project creates new IP, which might also be shared with customer - IP is particularly valuable	L	No IP Expected

	Acquisitions and subcontracts	None or limited to simple P-Card or B2B procurements	**- Requires the use of formal purchase requisitions to acquire services or off-the-shelf products from known vendors** **- Involves modest capital expenditures**	- Project depends on delivery of specialty products or products from vendors with little PNWD history - Project success depends substantially on delivery of product or services from others - Involves significant and/or complex capital expenditures	M	Some support equipment and services will need to be procured to perform this project scope. These expenditures will be modest in nature. The project may have to procure (design, build, fabricated) fuel segmentation equipment, a commerical off the shelf (COTS) mid-level scanning electron microsocpe and COTS optical microscope. The risk will be mitigated by ensuring that well-defined technical and functional requirements drive the choices of equipment and services and identifying and assigning experienced technical administrators to manage the procurements.
Quality Assurance						
	Customer Specifies QA Requirements or Standard	None	Customer has some specific QA requirements and - Staff are experienced with needed QA - Minimal effort required (e.g., special records or use of existing analytical QA plan) - Customer reserves right to conduct QA audit	**Customer has significant and/or complex QA requirements** **- For example, NQA-1, HASQARD, NUQARD** **- Customer has specific configuration-control requirements** **- Staff have limited QA experience, relative to requirements**	H	(Low) Unirradiated OM/SEM Examination (AFIP-7)-Bldg 3410 (Low) Unirradiated Surface Examination-RPL (High) Thermo-Physical Properties of Irradiated Fuel-RPL The results of Thermo-Physical Property measurements will potentially be used by the client [and customer] in a report that will form the basis for a NUREG issued by the NRC. This risk will be mitigated by having a clear Quality Assurance plan and approach, and ensure compliance with that plan at all times. This plan may have to be presented for acceptance by the client. Expected Quality Control measure may include: - QA Audit (Internal) - QC Surveillances - QC hold points

	Customer Regulatory Involvement (Project provides direct regulatory support or customer will use the results in a regulated environment)	Results will not be used in a heavily regulated environment (EPA permits, environmental cleanup, operating licenses, etc.)	Results may be subject to regulatory scrutiny or are supporting agency rulemaking activities	**Customer will use results in a regulatory action (e.g., NEPA, license application, DOE Safety Class application, etc.) or in a highly regulated application**	H	(Low) Unirradiated OM/SEM Examination (AFIP-7)-Bldg 3410 (Low) Unirradiated Surface Examination-RPL (High) Thermo-Physical Properties of Irradiated Fuel-RPL The results of Thermo-Physical Property measurements will potentially be used by the client [and customer] in a report that will form the basis for a NUREG issued by the NRC. This risk will be mitigated by having a clear Quality Assurance plan and approach, and ensure compliance with that plan at all times. This plan may have to be presented for acceptance by the client. Expected Quality Control measure may include: - QA Audit (Internal) - QC Surveillances - QC hold points
	Deliverables - Written	- Non-controversial basic research results published in journals - White papers - Routine technical reports	**Written deliverables contain:** **- Data or conclusions that can impact customer actions** **- Results that are from non-routine technical approaches** **- Results that may be controversial**	- Sensitive data or recommendations - Results feed into a highly sensitive environment - Results support a product that must function in a highly reliable manner	M	The results of this work could potentially impact program decisions and actions since they may form the basis of a NRC NUREG. Appropriate peer review of results (and QA) will be performed at every stage in the project. INL staff will be invited to participate in analyzing and discussing measurement results such that "surprises" are minimized to the greatest extent possible.
	Deliverables - Software	**- No software is delivered to the customer or research community** **- Existing, proven software is used to support the research**	Software delivered to customer or research community that is not categorized as Safety Software or will not be used in sensitive applications	- Software categorized as "Safety Software" - Software that will be used by customer for sensitive activities (security, intelligence analyses, etc.	L	

	Deliverable - Hardware	**No hardware is delivered to customer or research community**	Hardware is developed for customer use in a normal industrial or conventional environment	Hardware is developed for customer use in a high-risk environment, such as nuclear or radiological applications, public safety, or national defense	L	
Operational Considerations						
	Security	**Normal business requirements:** **- USA Business Travel** **- PNWD staff who are foreign nationals with FNVA working on unclassified projects**	Project uses: - Foreign nationals - Sensitive unclassified information - Classified materials with an experienced staff - Controlled substances - International travel - Category IV special nuclear materials	Project uses: - Foreign nationals on unclassified portion of classified project - Category III special nuclear materials - Classified matter and project staff is inexperienced with handling it	L	LEU and Irradiated material is expected to be easily within the limits of the RPLand 3410 Safety Basis (note 3410 Safety Basis is being modified to accommotate this project) which includes safeguards, criticality safety and radiation control
	Environment, Safety & Health	No ES&H issues: - Project work is done on-site - No lab work - Project work is all or mostly paper or workstation-based	**Known and manageable ES&H issues:** **- Work performed in IOPS spaces** **- Routine, low-risk work offsite, i.e., known site, proven access, simple activities** **- Project will generate hazardous, radiological, or mixed waste**	Project involves actions with significant ES&H implications - Large ES&H issues with significant potential risks - ES&H issues are complex - Offsite work with potential ES&H impact - Work with certain biological agents	M	This project will involve characterization of both unirradiated and irradiated fuel samples. Thus, the project will generate radiological and/or mixed waste. Staff at RPL that will be involved in this project are familiar with working in such an environment and with these types of materials. There are existing waste streams that can be used to dispose of waste materials. The waste value is small compared to the faciltiy operations waste. 3410 has existing dry rad waste, mixed waste and regulated waste (acid etching) streams (Justin Slone)

	Special Operational & Regulatory Concerns (Projects requires specific regulatory support, e.g. environmental or transportation issues)	None	**- Work uses regulated materials and produces regulated wastes and/or sewer discharges** **- Known and manageable environmental issues (e.g. work permitted in IOPS Spaces)** **- Work uses radioactive materials**	Project involves materials listed under medium risk and requires EA/EIS, permits or notifications (e.g. DOH NOC, RCRA permit), license revision, etc.	M	This project will involve characterization of both unirradiated and irradiated fuel samples. Thus, the project will generate radiological and/or mixed waste. RPL has an existing permitted on-stie treatment for RCRA regulated materials. 3410 has existing dry rad waste, mixed waste and regulated waste (acid etching) streams (Justin Slone) These activitivities are covered under the DOH permit provided it is done under filtered hoods. Project has verified that Glovebox 3410-HVEF-GB-1403-1 and Fume Hood 3410-HVEF-FH-1403-2 have local HEPA filtration. Scope does not currently include transportation of sample on public highway under 49CFR.
	Research Site Access	**Project is within PNWD offices or labs**	Project is at external site for which we have good experience	Project is at new site, multiple sites, or a foreign location	L	
	Use of Human or Animal Subjects	**None**	None	- Work involves use of human subjects - Work involves use of animal subjects	L	
	Use of Sealed Sources	**None**	- Work with Type 1 (including sources contained in instruments) or Type 2 Robust Sealed Sources	- Work with Type 2 Fragile Sealed Sources	L	

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