Implementation Plan

UF-19IN020210

NSUF CoMET Project

Idaho National Laboratory

NSUF CoMET
Implementation Plan

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Approved by

Brenden Heidrich	Date
NSUF Chief Scientist, Irradiation	

Daniel Ogden	Date
NSUF Deputy Director	

J. Rory Kennedy	Date
NSUF Director	

REVISION LOG

Rev.	Date	Affected Pages	Revision Description

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1. PROJECT SCOPE, SCHEDULE, and COST

The Combined Materials and Experiment Toolkit (CoMET) is an NSUF information management resource designed to give users access to the information and tools necessary for designing meaningful experiments and writing clear, structured proposals. NSUF has a milestone to deploy an experiment design expert system to the NSUF website to support applications for the FY2020 CINR, due on August 30, 2019. To meet this milestone, the CoMET project work for FY2019 focuses on three main objectives:

1) **Integrate the three NSUF web applications** by linking data fields in one application with the data found in the others. The NSUF web applications are:
   a. The Rapid Turnaround Experiment (RTE) Proposal Solicitation system at https://nsuf-proposal.inl.gov;
   b. The Nuclear Fuels and Materials Library (NFML) and the Nuclear Energy Infrastructure Database (NEID) at https://nsuf-infrastructure.inl.gov; and
   c. The researcher and technical staff account and profile management systems in the main NSUF website at https://nsuf.inl.gov that power the Nuclear Energy Researcher Database (NERD).

2) **Build an Experiment Design Wizard** (expert system) that will guide users through the process of writing a statement of work for a CINR or RTE experiment. The "wizard" will access the NSUF applications listed above as well as new content to guide the PI through the process. The wizard will provide much of the expertise of an NSUF technical lead at the earliest stages of a proposal, without taxing NSUF resources.

3) **Build an Irradiation Effects Calculator** to help a PI choose the best neutron irradiation facility for their needs, estimate the time needed to achieve their goals, and estimate the resulting radioactivity of their samples, post-irradiation. The "calculator" will support the "wizard" by providing estimates of irradiation and post-irradiation conditions so that the PI can select the appropriate facilities for their project.

These objectives are designed to support the mission of the NSUF and optimize the experiment design portion of the proposal processes. The new researcher database will make finding collaborators easier. The wizard will provide the PI with early NSUF expertise so that their proposed experiments, at the "Letter of Intent" and "Pre-Application" stages are better designed to work within the available NSUF facilities. Utilization of these tools should reduce the proportion of proposals that are judged to be infeasible or "not ready" for NSUF access. It should also improve the efficiency of the NSUF technical leads since the PI will be starting with a better statement of work for the project. The tools will also provide resources for NSUF staff to more efficiently screen and score incoming proposals.

This implementation plan will layout the work breakdown structure, activities, resources required, and plan for completion of the activities for CoMET in FY2019.

1.1   Mission Need

Nuclear Science User Facilities (NSUF) offers research opportunities for nuclear energy researchers by providing access to world-class nuclear research facilities, technical expertise from experienced scientists and engineers, and assistance with experiment design, assembly, safety analysis, and examination. These services are provided at no cost to the researcher (user) through a competitive peer-reviewed process.

Dedicated NSUF staff size has remained approximately constant over the last decade, but the number of proposals has increased over nine times in from 2013 to 2018 (see Fig. 1). This has resulted in NSUF staff having less time to assist each proposal writer and more burden on the available NSUF technical leads (tech leads).
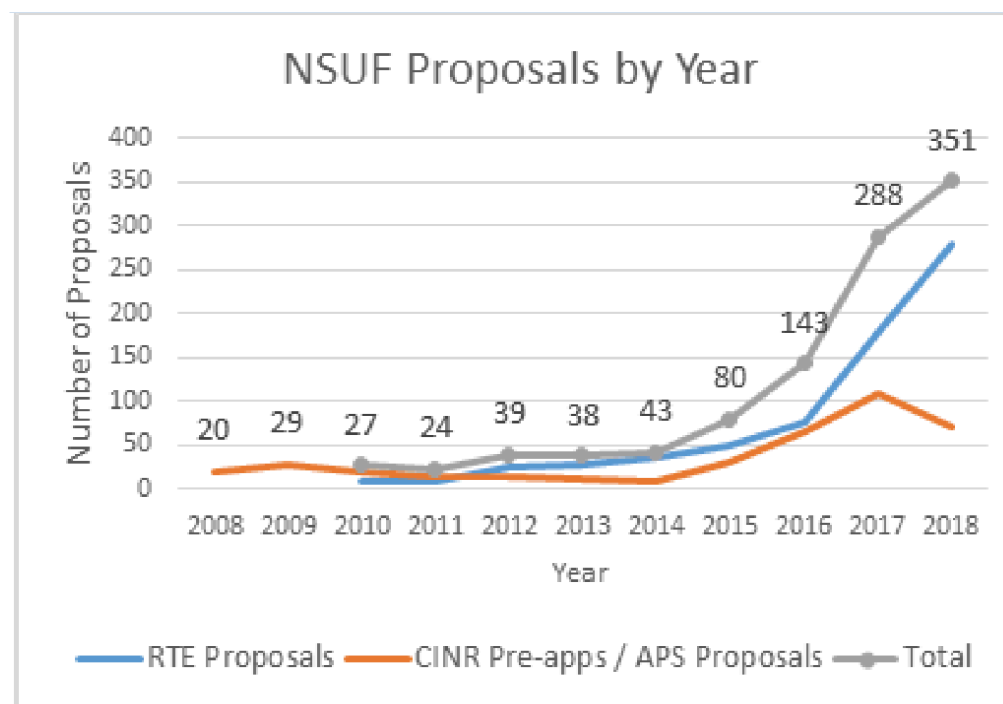
Figure 1: Growth in Proposals for NSUF Access (2008-2018)

NSUF and partner facility staff receive many phone calls and emails from proposal writers asking for information or clarification. Much of the requested information is available through various websites or other resources, but is not always easy to locate. Additionally, proposals are generally written somewhat free-form, requiring reviewers to search multiple documents for the information they need to be able to score the proposal.

The CoMET database integration and wizard systems will allow users to more easily locate and access the information that they need to design meaningful experiments and write clear proposals in a collaborative manner. It provides a consistent format for essential information reviewers need to score the proposals, and provides a means for new collaborators (e.g., NSUF tech leads, facility operators) to quickly understand the essential points of the experiment.

1.2   Project Description

1.2.1   Integration of the NSUF Web Applications

The NSUF information management systems run on three distinct web sites (Figure 2):
1. The main website and portal to everything else at https://nsuf.inl.gov. This hosts the researcher and technical staff account and profile management systems that power the Nuclear Energy Researcher Database (NERD).
2. The Rapid Turnaround Experiment (RTE) Proposal Solicitation system at https://nsuf-proposal.inl.gov;
3. The Nuclear Fuels and Materials Library (NFML) and the Nuclear Energy Infrastructure Database (NEID) at https://nsuf-infrastructure.inl.gov.
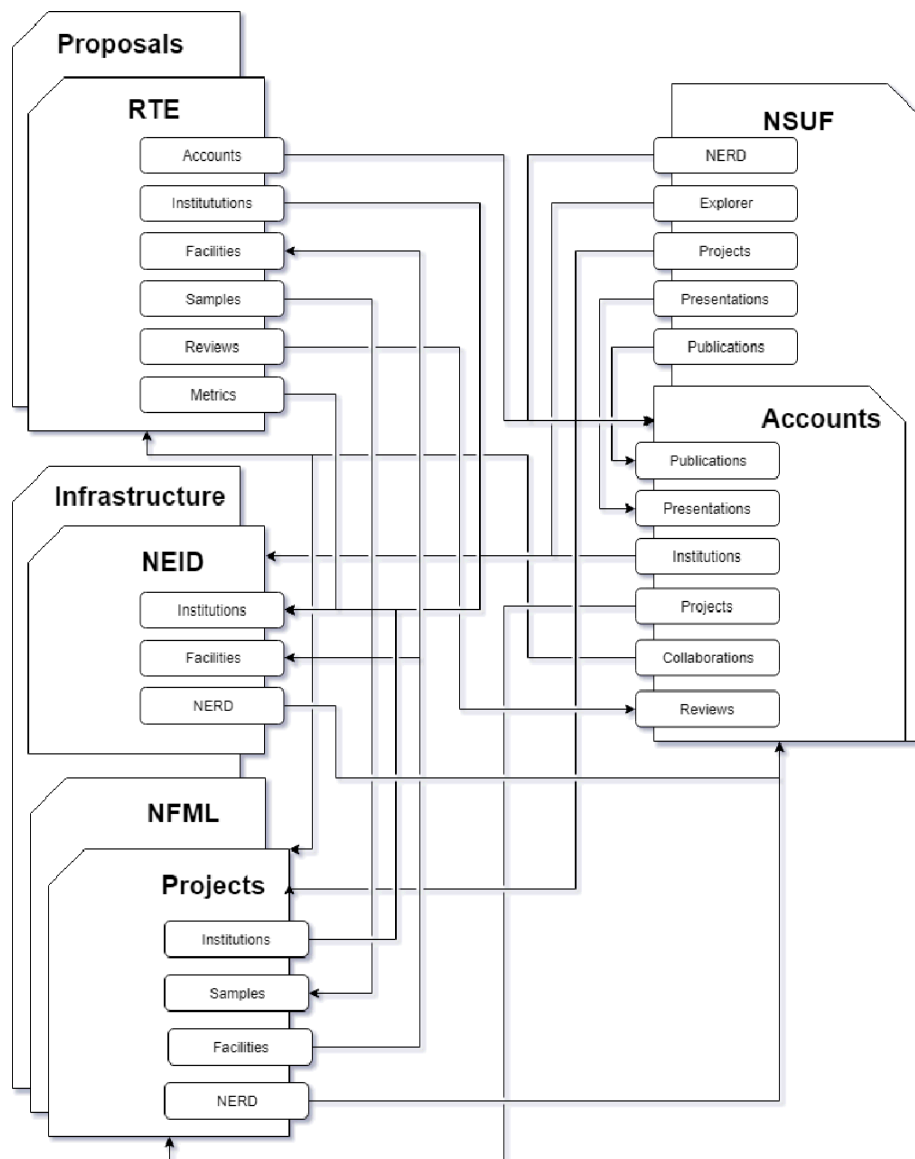

Figure 2 Relationship Between NSUF Web Applications

CoMET will interact with all the components on the NSUF suite of applications.

CoMET is intended to unify various NSUF systems into a coherent, integrated, and intuitive system that meets the following goals:
1. Collaboration and improved functionality for team-based research;
2. Integration and improved efficiency of related information management systems and functions;
3. Simplification of proposal application workflow and associated NSUF business processes; and
4. Improved access to NSUF information resources for researchers.

Figure 3 shows a more functional relationship between the three websites that form the NSUF system and how CoMET will integrate them.
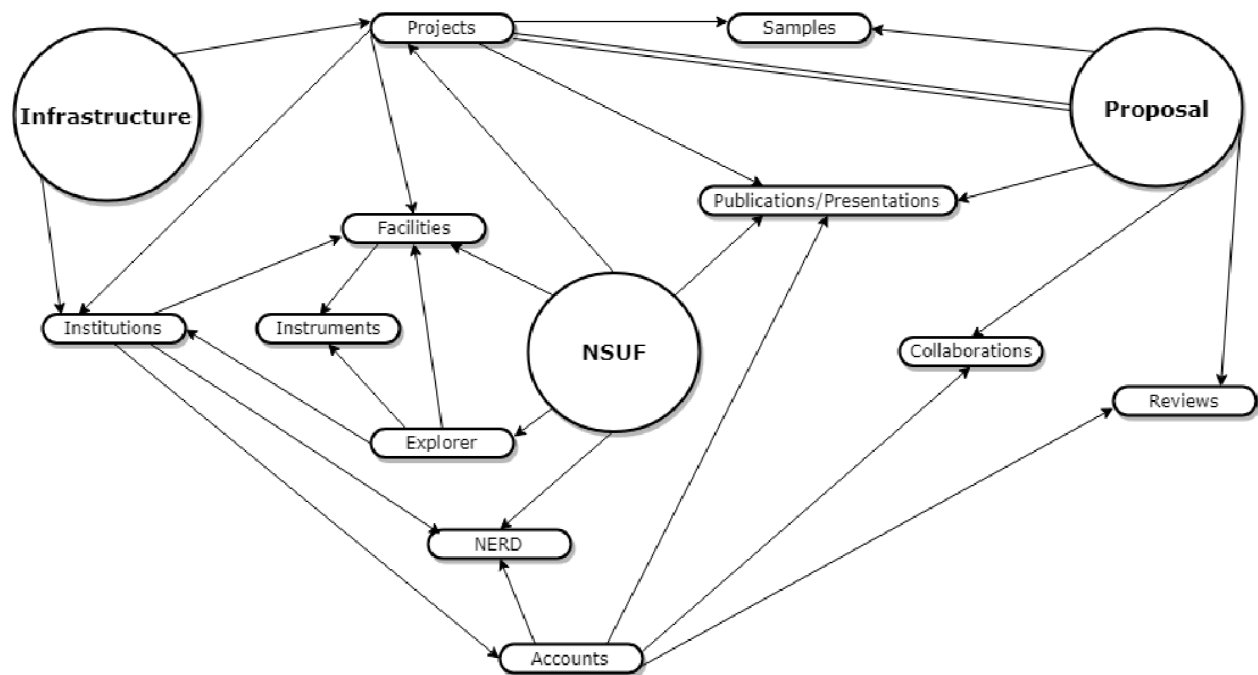
Figure 3 Integrated NSUF Databases under CoMET

The idea is that a researcher can access the NSUF website to look for a material in the NFML, follow the links on that page to the project that created the specimen, go directly to the facility that irradiated or tested the specimen, find publications on the project, and when they are ready, start writing an experiment in the Wizard, find collaborators to help, select new materials, facilities, and other capabilities, work with NSUF technical staff on the proposal and the either submit an RTE proposal directly into the NSUF system or generate a comprehensive statement of work to accompany a CINR proposal.

Many other start points are available to initiate the process. The goal of the integration portion of CoMET is to support easy navigation between all of the NSUF information management systems for researchers, reviewers, and NSUF and DOE-NE staff.

Experiment Wizard / Expert System

The second phase of CoMET will involve the building of an Experiment Design Wizard (expert system) that will guide users through the process of writing a statement of work for a CINR or RTE experiment. The "wizard" will access the NSUF applications listed above as well as new content to guide the PI through the process. The wizard will provide much of the expertise of an NSUF technical lead at the earliest stages of a proposal, without taxing NSUF resources.

The Wizard will start with two choices for the user: 1) Explore Resources or 2) Build an Experiment. The resource explorer will guide the user through the NSUF data resources explained in 1.2.1. The system will include context-sensitive help and contact links for NSUF staff. The experiment builder will further fork into purpose-built sections depending on the proposal systems needed. For example, NSUF supports: RTE, CINR, and Scientific Infrastructure funding opportunities. Rules and requirements for each opportunity can be included in the Wizard, reducing the proportion of proposals that are rejected for non-compliance. A generic nuclear materials experiment is also planned for inclusion in the Wizard. Additionally, other programs, such as GAIN or CAES, could build their own calls based on this framework.

Inside the experiment builder framework, the NSUF content coordinator can build a process to guide the researcher through all the steps to assemble the scope of work. Some of these steps will be the requirements from the FOA or RTE call, such as specimen readiness, relevancy to the NE mission, and budget. There will also be an opportunity to add collaborators from the NERD collaborator database, find materials from the NFML, and capabilities from the NEID. The Wizard will then ask guided questions to help the experimenter assess the best options for their work. They will be able to navigate through the previous NSUF funded projects and associated publications to ensure that their proposed work is relevant and not duplicative of previous work.

Note that the Wizard is not intended to generate the technical narrative, which describes the theory behind the experiment, but is intended to help them navigate the special situation of NSUF access.

1.2.2   Irradiation Effects Calculator

The final phase for FY2019 will build an Irradiation Effects Calculator to help a PI choose the best neutron irradiation facility for their needs, estimate the time needed to achieve their goals, and estimate the resulting radioactivity of their samples, post-irradiation. The "calculator" will support the "wizard" by providing estimates of irradiation and post-irradiation conditions so that the PI can select the appropriate facilities for their project.

Neutron irradiation in an NSUF-associated research or test reactor is one of the more opaque parts of an NSUF experiment to an outsider. The Calculator will help the researcher propose a more feasible and efficient project by providing time estimates for different positions in NSUF partner facilities, as well as providing estimates of activity and effective dose rate to help determine feasibility at different irradiation and post-irradiation examination (PIE) facilities.

1.3   Scope of work to Deploy CoMET

1.3.1   Summary of Work

Work has been proceeding on the CoMET and its predecessors since late FY2018. As of March 1, 2019, much of the foundational work has been completed. For the remaining seven months of FY2019, the activities can be summarized as:

Database Integration
- Complete remaining integration activities
- Verify the links between NSUF databases function and are correct.

Expert System/Experiment Wizard
- Finalize the structure of the ESEW for a CINR Project
- Compile and fill the content
- Verify the structure and content are correct by comparing to CINR proposals.

Irradiation Effects Calculator
- Finalize the programming for the two parts of the calculator
- Verify the implementation and data are correct via testing against as-run physics ECAR for CINR projects

1.3.2   CoMET Work Breakdown Structure
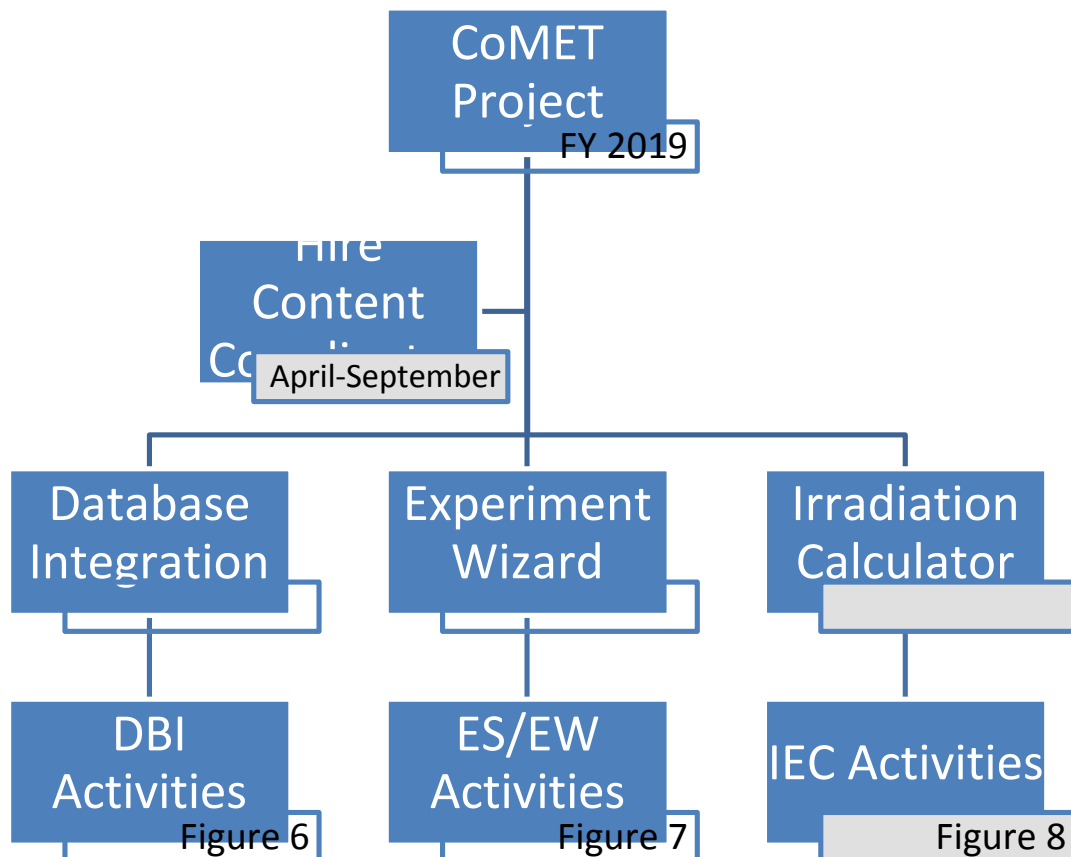
Figure 4 FY2019 CoMET WBS

1.3.3   Hire new Content Coordinators

Activity: Two new INL/NSUF staff were hired and will start work in March 2019. They need to be introduced to the NSUF information management resources and CoMET.

Outcome: Two new NSUF staff members demonstrate a good working knowledge of the NSUF information management resources, CoMET, and their roles in the project.

Task	Responsible	Duration	Due Date
a. Train MG and AM on NSUF resources	DW, JA	40 hours	
b. Train MG and AM on CoMET Development	DW, JA	40 hours	1 April
c. Train MG and AM on individual assignments	BH, DW, JA	40 hours	

1.3.4   Database Integration Scope and Activities
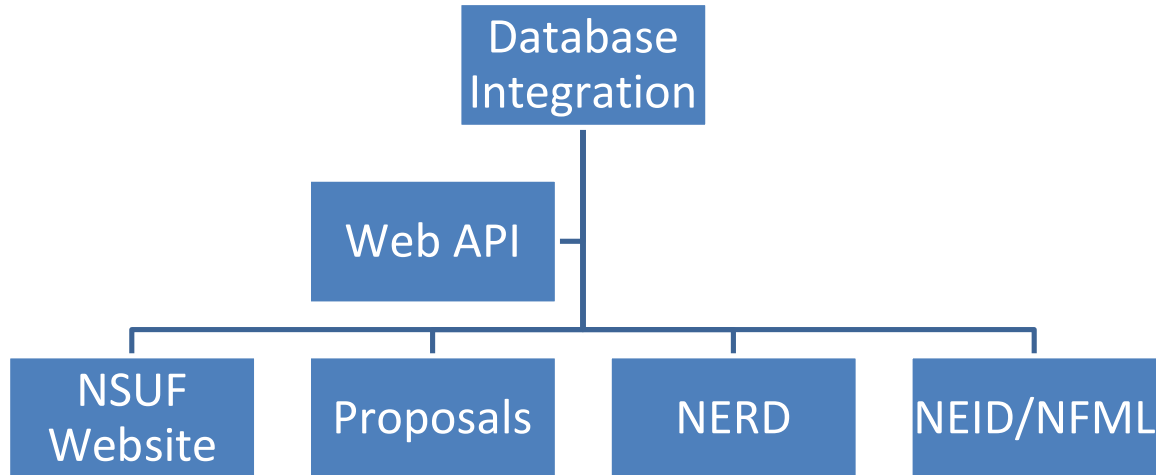
Figure 5 Database Integration Area WBS

1.3.4.1   Purpose

The NSUF system includes three separate websites with multiple databases that were originally created for their own purposes. Under CoMET, these databases will be more fully integrated in order that a user can follow a trail from one to another seamlessly. They will also be able to be accessed from the Experiment Wizard to provide information to search existing research, identify capabilities, materials, and

collaborators, and build and NSUF experiment for the CINR or an RTE call.

1.3.4.2   Activities

1.3.4.2.1   Advanced Programming Interface (Web API):

Activity: CoMET deployment includes the development of a Web API that allows information from each system to be used in the other systems to allow free navigation between projects, people, organizations, samples, and projects. Available via API Key, the API returns data for a number of queries that can be consumed and utilized by and integrated into external web applications. NSUF will leverage the Web API to allow integration of live data from the NEID and NFML into the Experiment Wizard as well as external websites (such as INL.gov, energy.gov, or GAIN.INL.gov) as allowed by NSUF.

Outcome: The Web API tool is completely integrated into the Wizard and available for use by external websites.

Task	Responsible	Duration	Due Date
a. Complete integration of Web API for use in CoMET and Experiment Wizard	MG, AM	40 hours	
b. Complete internal work to make the Web API available for external website use	DW	done	

1.3.4.2.2   Nuclear Fuels and Materials Library (NFML)

1.3.4.2.2.1   NFML Material Keywords

Activity: Materials in the NFML will be tagged with intuitive Material Keywords to provide synonyms to improve searching and building a research plan.

Outcome: the NFML will be searchable via a new keyword tagging system and the material entries will have new information added.

Task	Responsible	Duration	Due Date
a. Complete the material naming and classifications, keywords, and other data gathering for the materials in the NFML	JA, MG, Simon	80 hours	
b. Implement the nomenclature upgrades in the NFML	DW	10 hours	
c. Perform checks to verify the upgraded			

Task			
nomenclature and search works as planned.			

1.3.4.2.3   *Nuclear Energy Infrastructure Database (NEID)*

1.3.4.2.3.1   *NEID Capability Keywords*

Activity: Capabilities (facilities and instruments) will be tagged with intuitive Capability Keywords to provide synonyms to improve searching and building a research plan.

Outcome: the NEID will be searchable via a new keyword tagging system and the capabilities entries will be rewritten to support the Wizard.

Task	Responsible	Duration	Due Date
a. Identify keywords of interest for NSUF partner facilities and instruments in the NEID	JK, MG, AM	80 hours	
b. Implement the keyword system into the NEID	DW	20 hours	
c. Cleanup data in the "capabilities" sections of the NEID to prepare them for utilization in the Wizard resources pages.	JK, MG, AM	160 hours	
d. Perform checks to verify the NEID keyword search works as planned.	AM	10 hours	

1.3.4.2.4   *Nuclear Energy Researcher Database (NERD)*

1.3.4.2.4.1   *NERD SME integration and Keywords*

Activity: Researchers, users, and technical experts in the NERD will be tagged with intuitive Research Keywords to improve searching and building a research team. Keywords for each can be searched, sorted and filtered, and links to researcher profiles and affiliated institutions from the NEID will be added.

Outcome: the researcher entries in the NERD will be searchable via a new keyword tagging system and a new system will be implemented to import entire databases of new researchers.

Task	Responsible	Duration	Due Date
a. Implement keyword system in NERD	DW	done	

Task	Responsible	Duration	Due Date
b. Complete integration into NEID	DW	10 hours	
c. Perform checks to verify the NERD keyword search and NEID integration works as planned.	AM	10 hours	

1.3.4.2.4.2   NERD additional data

Activity: To improve the capability for collaboration, sources of data will be requested and (if approved) migrated to populate the NERD list with extant data sets of researchers affiliated with Nuclear Energy.

Databases to be explored:
- Faculty and staff from the Center for Advanced Energy Studies (CAES) members
- Nuclear Science and Technology Directorate Biography database (https://nst.inl.gov/SitePages/Biographies.aspx)
- Idaho National Laboratory Researcher Bios (https://bios.inl.gov/SitePages/Researcher%20Directory.aspx)
- Nuclear Science & Engineering Education Sourcebook 2018 (accessed at https://NEUP.inl.gov), complied by the American Nuclear Society – Education, Training, and Workforce Division.

Outcome: a new system will be implemented to import entire databases of new researchers and new data may be added, if available.

Task	Responsible	Duration	Due Date
a. Present NERD capabilities to prospective database owners (NST, INL, CAES)	BH, DW	25 hours	
b. Setup opt-in/opt-out privacy system	DW	30 hours	
c. Import new data to the NERD	DW	20 hours	
d. Implement new user privacy system	DW	done	
e. Perform checks to verify the new user integration works as planned.	AM	10 hours	

1.3.5   Expert System / Experiment Wizard Scope and Activities
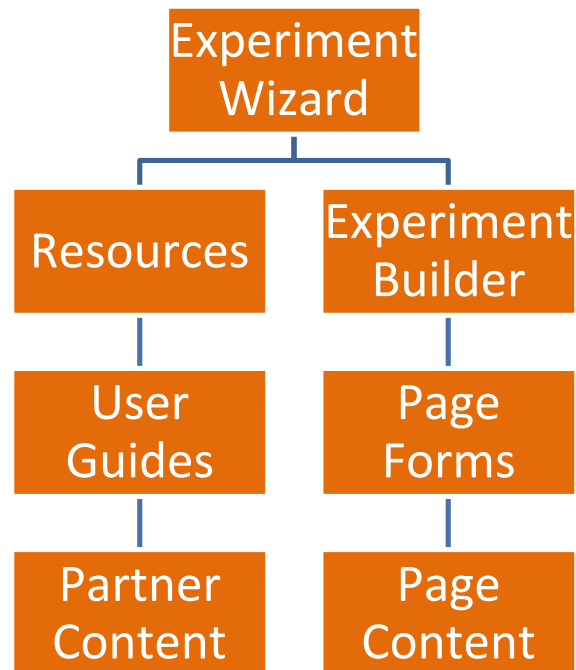
Figure 6 Experiment Wizard Area WBS

1.3.5.1   Purpose

The main NSUF website will host a new application designed to accomplish the following goals:

a) Improve the quality of proposals by providing researchers with access to resources relevant to their experiment

b) Reduce the amount of documentation the experimenter is required to be aware of by providing only information relevant to their experiment

c) Improve the quality of research by guiding research to areas relevant to the mission and goals of the Office of Nuclear Energy

d) Foster collaboration between researchers and experiment managers

e) Improve the quality and accuracy of institutional capability information and resources

1.3.5.2   Activities

1.3.5.2.1   Wizard Resources

1.3.5.2.1.1   Integrated User Guides

Activity: The Wizard will integrate User Guide-style information into the website to be accessed as a user is building an experiment.

Outcome: NSUF partner facility user guides are integrated into the Wizard Resource System.

Task	Responsible	Duration	Due Date
a. Obtain updated user guides from NSUF partners (as available)	JK, MG, AM	80 hours	
b. Convert the user guides to web content in the Wizard	MG, AM	120 hours	
c. Have NSUF partner facilities verify that the information is correct.	JK, MG, AM	40 hours	

1.3.5.2.1.2   Experiment Wizard Resource Content

Activity: Resource information that isn't necessarily relevant to a proposal or experiment can be included as 'Informational' pages that are not included in the export – however, should the end user(s) find the information worth retaining, they can 'bookmark' the information to add it to an appendix of their export document.

Outcome: The Wizard Resources section has data and information on NSUF partner capabilities to assist users in choosing facilities for proposals.

Task	Responsible	Duration	Due Date
a. Identify NSUF partner facilities needing information added to Wizard Resources	JK, MG, AM	80 hours	
b. Contact NSUF partner POC to gather information.	JK, MG, AM	80 hours	
c. Supervise and assist NSUF partners' data entry in Wizard Resources (this may be more work by the CC rather than partners)	MA	20 hours	
d. Verify Experiment Wizard has information			

for all NSUF partner facilities and capabilities			

1.3.5.2.2 Wizard Experiment Builder

1.3.5.2.2.1 Experiment Wizard Page Content

Activity: Pages of content are organized hierarchically and can be structured to create 'tracks' that the end user can take to complete a process. The selections made by the user as they navigate the content, and the information they provide along the way are stored by the application.

Outcome: The Wizard has structures built to guide users through and experiment design process for the CINR (and RTE). These pages will ask questions like a technical lead would.

Task	Responsible	Duration	Due Date
a. Layout the steps required/pathway for an NSUF materials experiment	BH, JA, MG, AM, Tech Leads	100 hours	
b. Build this framework in the Wizard	JA, MG, AM	120 hours	
c. Ensure these pages function together and link to the Wizard Resources	JA, MG, AM	100 hours	

1.3.5.2.2.2 Experiment Wizard Form Content

Activity: Each page of content can optionally include a dynamic form to collect information from the end user. The information collected is retained and can be edited at any time by the user. Forms can include any standard web form field, including full support for file uploading.

Outcome: The Wizard has structures built to solicit information from users during the experiment design process for the CINR (and RTE) to help build the experiment SOW. These pages will take input from the user like a technical lead would.

Task	Responsible	Duration	Due Date
a. Work within the Wizard framework to determine where information should be taken from the user and stored or sent to the NSUF facilities	JA, MG, AM	140 hours	
b. Implement the forms within the Wizard			

	CINR (and RTE) structure to gather information.			
c.	Ensure that the forms built either store or send the user responses as desired	AM	10 hours	

1.3.5.3   Wizard Validation

Activity: Pre-deployment testing to ensure the content and organizational structure of the wizard meet the goals of the application.

Outcome: The Wizard will be tested to ensure that it can be used to guide users through the NSUF materials experiment design process.

Task	Responsible	Duration	Due Date
a. Perform internal checks on the Wizard by implementing existing or proposed experiments through the Wizard tool.	JA, AM	80 hours	
b. Support and supervise (as needed) a selected group of NSUF community volunteers to conduct a closed beta test of the Wizard and Calculator	BH, DW, AM	100 hours	
c. Gather user feedback and issues arising during internal testing for the Wizard	AM	10 hours	
d. Implement fixes to Wizard based on feedback during testing	DW, MG, AM	120 hours	

1.3.6   Irradiation Effects Calculator Scope and Activities
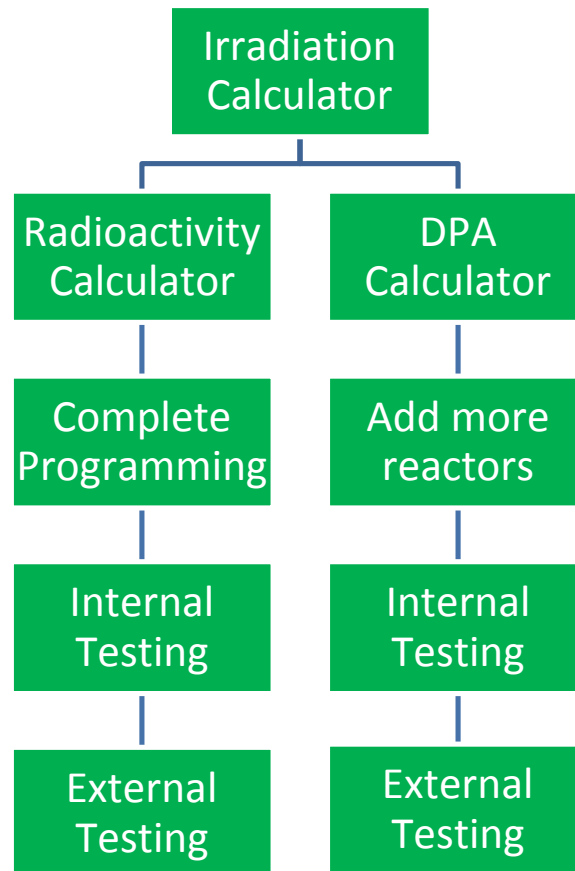
Figure 7 Irradiation Effects Calculator Area WBS

1.3.6.1   Purpose

The effects of neutron radiation on materials is difficult to estimate, and usually left to professional analysts. NSUF has created an online calculator to estimate neutron damage (displacements per atom, or DPA) as well as activation after irradiation for a certain time. The calculator will be utilized as one of many NSUF-provided systems and sources of data by the CoMET Experiment Wizard.

Currently, the tool asks the user for a desired DPA amount and a weight-percent elemental composition for a material. The calculator uses flux values calculated from MCNP models of NSUF partner reactors. DPA rates have already been calculated for each position, from which the irradiation time necessary to obtain the desired DPA is calculated.

The time for each position is displayed on a matrix for all available reactor positions (currently the Advanced Test Reactor at INL and the High Flux Isotope Reactor at ORNL).

Selecting a position will return a screen that provides the user with an estimate of the radioactivity of the material based on the irradiation duration to obtain the desired DPA for the flux profile at that position.

This calculator will be developed as a general scoping tool to provide end users with the basic

information they need to select a suitable position and reactor for their experiment. It is not intended to replace the more accurate calculators available to Experiment Managers which are subject to export control.

1.3.6.2   Activities

1.3.6.2.1   Radiation Damage Calculator (DPACalc)

The DPA calculator was developed to convert DPA to fluence for NSUF partner reactors and return the amount of time needed to reach a target DPA for a given material composition.

1.3.6.2.1.1   Add additional NSUF partner reactors

Activity: ATR and HFIR are included in the calculator. The following reactors should be added in FY2019:

- MITR-II
- NCSU PULSTAR and/or OSURR

Outcome: The DPA Calculator will estimate the time needed to reach a target DPA for a given material composition at various NSUF partner facility reactors. The estimate is a scoping tool, intended to inform the user of the most efficient test reactor positions. It does not replace a formal physics analysis.

Task	Responsible	Duration	Due Date
a. Request MCNP decks from partners or that the partner will run MCNP to our requirements.	BH	20 hours	
b. Convert MCNP output to data suitable for the calculators and input into the calculator application.	BH, MG, AM	60 hours	
c. Test the calculator with the newly added reactor data	MG	40 hours	

1.3.6.2.2   Radioactivity Calculator (RadCalc)

The radioactivity calculator takes the material composition and flux spectrum from the DPA calculator and estimates the activation of the materials (per gram) and the gamma dose rate at 30cm. This will help choose the correct PIE facilities for the project.

1.3.6.2.2.1   Finalize the radioactivity calculator

Activity: The RadCalc needs to undergo an internal (to NSUF) verification to compare its output to ORIGEN-S. Then safety factors will be calculated and added to the code output so that the activity estimate is conservative for most cases. Once this is completed, the program will be locked and can be sent for external validation.

Outcome: The Activation Calculator will estimate the radioactivity and dose rates for a given material composition for various times in NSUF partner facility reactors. The estimate is a scoping tool, intended to inform the user of the likely radiation levels so that appropriate PIE facilities can be chosen. It does not replace a formal physics analysis.

Task	Responsible	Duration	Due Date
a. Complete comparison of RadCalc against ORIGEN-S.	JA, MG	80 hours	
b. Implement upgrades to the RadCalc tool to correct accuracy issues and write guidance for the user to interpret the results.	JA, DW	0 hours	
c. Retest the finalized RadCalc against ORIGEN-S	JA	20 hours	

1.3.6.2.3   Calculator Scientific Review

Activity: Analysis and review of DPA and Radiation Calculators as suitable scoping tools.

Outcome: The Calculator will produce results that are comparable to the INL reference codes (SPECTRE for DPA and ORIGEN for activity. These results must only be useful as a scoping tool at the early stage of LOI and Pre-application writing.

Task	Responsible	Duration	Due Date
a. Perform final internal calculator review. Pay specific attention to fast neutron generation of cobalt-60 or other (n,p) reactions.	BH, MG	80 hours	
b. Write testing specification for external review	BH	10 hours	
c. External review of calculator using As-Run physics analysis of BSU-8242 experiment by C130 staff	BH, C130 staff (external)	50 hours	
d. Review of external check and certification of calculator for deployment	BH	15 hours	

2.   Schedule

The CoMET deployment project is baselined in the PICS:NE system. The work-package UF-19IN020210, spans FY2019 and has two milestones:

- M3UF-19IN0202103 - Submit CoMET Implementation Plan (Heidrich) - Due 03/01/2019 , Submit CoMET Implementation Plan for the building, testing, and deployment of the CoMET application to the NSUF website.
- M3UF-19IN0202102 - Deploy Experiment Design Expert System (Heidrich) - Due 8/30/2019, Deploy Experiment Design Expert System to the NSUF website to support applications for the FY2020 CINR.

In-Progress/Pending task critical path:

Table 1 Tasks Required for Completion of CoMET system

Area	Resources [hours]	Start Date	End Date
New Staff Training	120	3/25/2019	3/28/2019
Web API	40	7/1/2019	7/12/2019
NFML Integration	110	3/4/2019	4/5/2019
NEID Integration	270	4/1/2019	5/31/2019
NERD Keywords	20	4/1/2019	4/15/2019
NERD Additions	120	3/4/2019	5/31/2019
Integrate User Guides	240	4/15/2019	5/31/2019
Wizard Resource Content	470	4/15/2019	6/14/2019
Wizard Experiment Content	320	3/4/2019	6/28/2019
Wizard Experiment Forms	310	3/4/2019	6/28/2019
Wizard Testing	310	6/28/2019	7/26/2019
Add Partner Reactors to Calculator	120	4/8/2019	6/28/2019
Radiation Calculator	100	3/4/2019	5/31/2019
Calculator Testing	150	6/3/2019	7/26/2019
Free Testing Period		7/29/2019	8/29/2019
Deployment Milestone			8/30/2019

Activity	March 4-15	March 18-29	April 1-12	April 15-26	April 29-May 3	May 6-17	May 20-31	June 3-14	June 17-28	July 1-12	July 15-26	July 29-August 1	August 5-15	August 19-30
New Staff Training		▣ gray												
Web API										■ blue	▦ red			
NFML Integration	■	■	■											
NEID Integration			■	■	■	■	■							
NERD Keywords			■											
NERD Additions	■	■	■	■	■	■	■							
Integrate User Guides				▨	▨	▨	▨							
Wizard Resource Content								▨						
Wizard Experiment Content	▨	▨	▨	▨	▨	▨	▨	▨	▨					
Wizard Experiment Forms	▨	▨	▨	▨	▨	▨	▨	▨	▨					
Wizard Testing										▦	▦			
Add Partner Reactors to Calculator			▩	▩	▩	▩	▩	▩	▩					
Radiation Calculator	▩	▩	▩	▩	▩									
Calculator Testing							▦	▦	▦	▦	▦			
Free Testing Period												▦	▦	▦

Figure 8 Schedule of Activities

See the appendix for a more detailed schedule.

2.1   Cost Baseline

The CoMET deployment project is baselined in the PICS:NE system. The FY2019 budget and performance up through January 2019 are shown here.

FY 2019	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Cumulative PV	49,758	95,699	134,707	188,842	240,806	293,260	356,499	433,816	512,873	610,170	693,978	755,304	188,842
Cumulative EV	0	95,699	134,708	188,843	0	0	0	0	0	0	0	0	188,843
Cumulative AC	0	45,480	65,137	104,852	0	0	0	0	0	0	0	0	104,852
CV	0	50,219	69,571	83,991	0	0	0	0	0	0	0	0	83,991
CV %	0.00%	52.48%	51.65%	44.48%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	44.48%
CPI	0.00	2.10	2.07	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80
SV	-49,758	0	1	1	0	0	0	0	0	0	0	0	1
SV %	-100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SPI	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

WBS elements that fall within the ±$25,000 and ±10.00% variance threshold are highlighted in green
WBS elements that exceed the ±$25,000 and ±10.00% variance threshold are highlighted in red

3. PROJECT ORGANIZATION AND INTERFACES

NSUF staff is designing and initially testing all features of CoMET. Some external personnel will be used for test cases, verification, or content creation, as described below.

3.1 Project Interfaces: External and Internal

NSUF staff not listed as part of the integrated project team in Section 2.2 are considered internal interfaces. Eternal interfaces are people who manage content in the system or who are performing validation and testing work.

Role / Task	People	Internal /External
Administrative Direction	J. Rory Kennedy, Dan Ogden	Internal
Advice / Perspective	Rory Kennedy, Simon Pimblott, Kelly Cunningham	Internal
Content Review / Creation	J. Keith Jewell, other Tech Leads? (C630 Department)	Internal
Content Creation	Facility leads or designees (NSUF partner POC)	External
Test Users	Selected INL researchers, some Facility leads, maybe others?	External
Calculator Validation	Experiment analysts at INL (C130 Department)	External

3.2 Integrated Project Team

The integrated team working on this project is rather small, with duties outlined below:

People	Roles
Brenden Heidrich	Administrative Direction
Dain White	Software Engineer/Database Architect
KaeCee Holden, Kelley Verner, Shannon Hurley	Calculator Creation, Testing (prior contributors)
Jordan Argyle	Content Creation, Test User, Calculator Validation
Jon Kirkham	Project Management / Content
Micah Gale	Content Coordinator
Angelica Mata	Content Coordinator

4. PROJECT CONTROL AND REPORTING

The CoMET deployment project is baselined in the PICS:NE system. Reporting will be done in PICS:NE on a monthly basis. The project has been authorized as part of the Awarded Research area (3.04.02.02) of the Nuclear Science User Facilities Program (3.04).

5. RISK

As the NSUF system does not directly interface with or effect any critical systems, integrating and expanding them through CoMET poses no programmatic or data risk.

Safety Software Determination Reference:
Completed SSD-000593: Safety Software Determination
(https://jwebapps3.inl.gov/SafeSWDetermination/OfficialRecord?ssdNumber=SSD-000593)

Potential risks to reputation or operation can come from:

- Maintenance debt, particularly for the NEID and reference sections

6. SAFEGUARDS AND SECURITY

There are no safeguards to consider.

This application has been updated to meet EU GDPR requirements.

Export Compliance Reviewed CoMET on 2/20/2019 and found no issues.

7. QUALITY ASSURANCE

The system is an extension of software previously <u>determined to be QL3</u>.

Reference: Completed ALL-000384: Quality Level Determination Direct Risk Analysis Method (https://edmvaultprd.inl.gov/edm10r/18458/4614267.pdf)

In addition to formal quality assurance requirements, CoMET will undergo a practical program of verification and validation for the various functional parts.

Initial drafts of Wizard content, workflows, and reference material will be subjected to review both within NSUF and without, and edited for clarity, usability, and characterization potential to help with proposal scoring. Work on the reference sections will include input from partner facility staff, and will likely need to undergo revision to ensure that the information provided facilitates users in making experimental design decisions.

The Irradiation Effects Calculator required significant data generation, including:

- Multi-group flux profiles for multiple positions in reactors
- Multi-group "displacement" cross sections (probabilities) for nearly 50 elements
- Evaluated DPA rates for each position's flux profile for each considered element
- Multi-group neutron absorption cross sections for hundreds of isotopes
- Decay chain information for all unstable isotopes considered

All of this data must be verified. DPA results for many elements were compared against INL ECAR documents, as well as experiments and standards, and found to be reasonably accurate. Activation data was compared for natural isotopic distributions of all elements through uranium against ORIGEN calculations, and found to generally be reasonably accurate. The tool is useful for scoping, except in noted exceptions.

8. HEALTH AND SAFETY

Safety Software Determination Reference:
https://jwebapps3.inl.gov/SafeSWDetermination/OfficialRecord?ssdNumber=SSD-000593

9.   RECORDS AND CONFIGURATION MANAGEMENT

The web application uses ASP.NET MVC 4.5 with C# as the principle server-side application code, utilizing RAZOR for the front-end interface, including jQuery libraries and plugins, JavaScript, HTML5, Cascading Style Sheets, JSON/SOAP/REST web service API formatting, with a managed Microsoft SQL Server as the backend database. The web application is located behind a Netscaler Web Application Firewall, and is located in the 'DMZ' enclave. Development and Acceptance database servers are located on a firewall-protected internal network enclave, and the Production database server is located in the 'DMZ' enclave supporting only SSH access via authorized Database Administrators at Information Management.

The web application database(s) are backed up nightly by Information Management. Website content on the server is backed up nightly. Software used to generate and produce the website application is stored in a secure source control repository using GIT. The web application is deployed via a continuous integration process using Team Foundation Services. Application Development and task management is provided through JIRA task management.

The web application is developed locally (via localhost) following the guidelines and requirements set forth by LWP 13620, and MCP-2022, and then pushed to an Acceptance server for quality assurance testing and review via a continuous integration build process powered by Team Foundation Services. When testing and review processes are complete, the web application(s) are scanned using a Hewlett-Packard WebInspect Enterprise web application vulnerability scanner to generate a threat and vulnerability report that is then included in the official software release.

Once a release is deemed ready for production, subject to the INL Software Release process, requiring approval by the Release Approval Board (RAB) at Information Management, with the final release to production handled by Information Management 'gatekeepers' via a continuous integration build process using Team Foundation Services.

Local control over content and access utilizes built-in access control systems within the NSUF web application that support role-based access to administrative systems, subject to administrative oversight by qualified NSUF staff. Access control systems utilize claims-based federated authentication powered by industry-standard Microsoft OWin technology and are encrypted via SSL.

10.   PROJECT CLOSURE

Once the final release for this application has been completed, and the content and functionality have been reviewed and approved, the software will be scanned for web application vulnerabilities and a formal release will be submitted to the Release Approval Board (RAB).

On approval, the release will be pushed to production servers by authorized staff at Information Management utilizing a continuous integration build process powered by Team Foundation Services. Any database changes required will be reviewed and executed in production by Database Administrators at Information Management utilizing a secure SSH tunnel to the production database server.

11. Appendix – Detailed Schedule and Resources

Application Area	Number	Task	Brenden Heidrich	Dain White	Jordan Argyle*	Jon Kirkham	Micah Gale	Angelica Mata	Other	Task Time
New Staff Training	1.3.3.a	Train MG and AM on NSUF resources		20	20					40
	1.3.3.b	Train MG and AM on CoMET Development		20	20					40
	1.3.3.c	Train MG and AM on individual assignments	10	10	20					40
Database Integration Activities										
Web API	1.3.4.2.1.a	Complete integration of Web API for use in CoMET and Experiment Wizard		0			20	20		40
	1.3.4.2.1.b	Complete internal work to make the Web API available for external website use		0						0
NFML (materials)	1.3.4.2.2.a	Complete the material naming and classifications, keywords, and other data gathering for the materials in the NFML			35		40		Simon (10)	80
	1.3.4.2.2.b	Implement the nomenclature upgrades in the NFML		10	0		0			10
	1.3.4.2.2.c	Perform checks to verify the upgraded nomenclature and search works as planned.					10			10
NEID (infrastructure)	1.3.4.2.3.a	Identify keywords of interest for NSUF partner facilities and instruments in the NEID				40	20	20		80
	1.3.4.2.3.b	Implement the keyword system into the NEID		20		0				20
	1.3.4.2.3.c	Cleanup data in the "capabilities" sections of the NEID to prepare them for utilization in the Wizard resources pages.				40	40	80		160
	1.3.4.2.3.d	Perform checks to verify the NEID keyword search works as planned.						10		10
NERD Keywords (people)	1.3.4.2.4.1.a	Implement keyword system in NERD		0						0
	1.3.4.2.4.1.b	Complete integration into NEID		10						10
	1.3.4.2.4.1.c	Perform checks to verify the NERD keyword search and NEID integration works as planned.						10		10
NERD Additions (people)	1.3.4.2.4.2.a	Present NERD capabilities to prospective database owners (NST, INL, CAES)	25	5						30
	1.3.4.2.4.2.b	Setup opt-in/opt-out privacy system		30						30
	1.3.4.2.4.2.c	Import new data to the NERD		20						20
	1.3.4.2.4.2.d	Implement new user privacy system		0						0
	1.3.4.2.4.2.e	Perform checks to verify the new user integration works as planned.						10		10
Experiment Wizard Activities										
Integrate User Guides	1.3.5.2.1.1.a	Obtain updated user guides from NSUF partners (as available)				40	20	20		80
	1.3.5.2.1.1.b	Convert the user guides to web content in the Wizard					60	60		120
	1.3.5.2.1.1.c	Have NSUF partner facilities verify that the information is correct.				20	10	10		40
Wizard Resource Content	1.3.5.2.1.2.a	Identify NSUF partner facilities needing information added to Wizard Resources				40	20	20		80
	1.3.5.2.1.2.b	Contact NSUF partner POC to gather information.				40	20	20		80
	1.3.5.2.1.2.c	Supervise and assist NSUF partners' data entry in Wizard Resources (this may be more work by the CC rather than partners)						20		20
	1.3.5.2.1.2.d	Verify Experiment Wizard has information for all NSUF partner facilities and capabilities				10	20	20		50
Wizard Experiment Content	1.3.5.2.2.1.a	Layout the steps required/pathway for an NSUF materials experiment	20		20		20	20	Tech Leads (20)	100
	1.3.5.2.2.1.b	Build this framework in the Wizard			20		60	40		120
	1.3.5.2.2.1.c	Ensure these pages function together and link to the Wizard Resources			20		60	20		100
Wizard Experiment Forms	1.3.5.2.2.2.a	Work within the Wizard framework to determine where information should be taken from the user and stored or sent to the NSUF facilities			20		60	60		140
	1.3.5.2.2.2.b	Implement the forms within the Wizard CINR (and RTE) structure to gather information.			40		60	60		160
	1.3.5.2.2.2.c	Ensure that the forms built either store or send the user responses as desired						10		10
Wizard Testing	1.3.5.3.a	Perform internal checks on the Wizard by implementing existing or proposed experiments through the Wizard tool.			40			40		80
	1.3.5.3.b	Support and supervise (as needed) a selected group of NSUF community volunteers to conduct a closed beta test of the Wizard and Calculator	40	20				40		100
	1.3.5.3.c	Gather user feedback and issues arising during internal testing for the Wizard						10		10
	1.3.5.3.d	Implement fixes to Wizard based on feedback during testing		40			40	40		120
Irradiation Effects Calculator Activities										
Partner Reactors	1.3.6.2.1.1.a	Request MCNP decks from partners or that the partner will run MCNP to our requirements.	20							20
	1.3.6.2.1.1.b	Convert MCNP output to data suitable for the calculators and input into the calculator application	20				20	20		60
	1.3.6.2.1.1.c	Test the calculator with the newly added reactor data					40			40
Radiation Calculator	1.3.6.2.2.1.a	Complete comparison of RadCalc against ORIGEN-S.			40		40			80
	1.3.6.2.2.1.b	Implement upgrades to the RadCalc tool to correct accuracy issues and write guidance for the user to interpret the results.		0	0					0
	1.3.6.2.2.1.c	Retest the finalized RadCalc against ORIGEN-S			20					20
Calculator Testing	1.3.6.2.3.a	Perform final internal calculator review	40				40			80
	1.3.6.2.3.b	Write testing specification for external review	10							10
	1.3.6.2.3.c	External review of calculator using As-Run physics analysis of BSU-8242 experiment by C130 staff	10						C130 staff (40)	50
	1.3.6.2.3.d	Review of external check and certification of calculator for deployment	15							15
		sum =	200	155	255	230	720	680		2240