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Nuclear Science User Facilities FY 2019 Program Performance Summary

Alison M Conner

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The INL is a U.S. Department of Energy National Laboratory
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PROGRAM PERFORMANCE SUMMARY:

Performance Category	Performance Metric		Performance Status
Program Performance	***I.***	***NSUF Awarded Research***	
	II.	***Partner Utilization***	
	III.	***Infrastructure Support Prioritization***	
	IV.	***Publications/Conference Proceedings***	
	V.	***Prominence/Positive Exposure for NSUF***	
	VI.	***NSUF Expand and Diversify User Community***	

Performance status is divided into three classifications: Metric Exceeded, Metric Achieved, and Metric Missed. These are indicated by the colors displayed below:

Performance Status

	*Exceeded*
	*Achieved*
	*Missed*

Background and Performance Evaluation Approach

The Nuclear Science User Facilities (NSUF) first gathered and reported metric data for Fiscal Year (FY) 2014. The goal of the *FY 2014 NSUF Metric Report* was to establish metric measures and to provide baseline data to evaluate future performance of the NSUF. Each metric goal and objective was established through NSUF discussions with Department of Energy (DOE) Idaho Operations Office and Office of Nuclear Energy staff. This report provides the data, analysis, and conclusions for the FY 2019 metrics.

In FY 2019, the NSUF made 108 awards, including 99 Rapid Turnaround Experiments (RTEs) and nine Consolidated Innovative Nuclear Research (CINR) projects. From its inception to the end of FY 2019, the NSUF has awarded 515 projects as follows:

RTE	432
Full/CINR	83
	515

In FY 2019, the NSUF was comprised of INL and the following partner institutions:

National laboratories (7)

- Argonne National Laboratory
- Brookhaven National Laboratory
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory

- Sandia National Laboratories.

Universities (10 plus CAES)

- Illinois Institute of Technology
- Massachusetts Institute of Technology
- North Carolina State University
- Purdue University
- Texas A&M University
- The Ohio State University
- University of California, Berkeley
- University of Florida
- University of Michigan
- University of Wisconsin
- The Center for Advanced Energy Studies (CAES), a research and education consortium among Boise State University, Idaho State University, University of Idaho, University of Wyoming, and Idaho National Laboratory.

Industry (1)

- Westinghouse Churchill Laboratory Services.

International Affiliate (1)

- Belgian Nuclear Research Centre (SCK-CEN).

Success of the NSUF is currently evaluated per six metrics:

I. **NSUF-Awarded Research**:
Metric Objective: Demonstrate efficient use of funding by maximizing funding available for new research awards.
Performance Metric: Percentage of available annual funding applied to new research awards.

II. **Partner Utilization**:
Metric Objective: Effectively utilize NSUF capabilities by providing researchers access to a variety of capabilities.
Performance Metric: Percentage of new awards (by funding) executed at partner facilities.

III. **Infrastructure Support Prioritization**:
Metric Objective: Support NE on management decisions related to infrastructure support prioritization.
Performance Metric: Percentage of infrastructure support awards that address priorities and gaps identified in the infrastructure database.

IV. **Publications/Conference Proceedings**:
Metric Objective: Publicize and document research results through publication in high-impact-factor peer-reviewed journals and conference presentations.

Performance Metric: Number of peer-reviewed publications and conference proceedings per year.

V. **Prominence/Positive Exposure for the NSUF**:
Metric Objective: Increase the prominence and positive exposure of the NSUF in the research community. This may be a temporary objective until we reach a saturation point, at which point the goal may be to "maintain."
Performance Metric: Number of invited lectures, plenary lectures, keynote addresses, promotions, awards, PhD dissertations, etc. resulting from NSUF project work or highlighting NSUF opportunities and capabilities.

VI. **Expansion and Diversification of the NSUF User Community**:
Metric Objective: Expand and diversify the NSUF user community.
Performance Metric: Number of proposals received gauged against number/year/available funding, project type, number of new PIs, institutions, geographic distribution, and minority-serving institutions.

End PROGRAM PERFORMANCE SUMMARY

I. NSUF Awarded Research

Metric Objective: Demonstrate efficient use of funding by maximizing funding available for new research awards.

Performance Metric: Percentage of available annual funding applied to new research awards.

Performance Goal: Apply at least 50% of available annual funding to new research awards, excluding directed activities.

This metric is the ratio of annual funding (new budget authority, not carryover) to the full costs of new awards. For example, $10M in new awards with a $20M effective budget (full appropriation minus directed activities, such as taxes) would result in 50% of annual funding being applied to new awards. This metric ensures an acceptable balance between funding for new research awards and funding for programmatic activities and capability investment.

The data for the analysis is summarized in Table 1. The first two columns are extracted from PICS-NE and include the WBS number, and a short description of the program area. The third column shows the total allotment for that activity. The fourth column was added to list the items for which the budget is available for awarded research. The fifth column lists the budgets that were allocated for awarded research. Note that for FY 2019, a portion of the $16.2 M in CINR awards was funded with carry over. The carry over funds are not included in this metric.

The items that are not included in the **Available for New Awards** column are discussed below:

1. Management and Integration work package funding is not available for new awards as these activities are directed by DOE.
2. PIE Coordination and Irradiation Coordination work packages funding is not available for new awards as the activities in these work packages are necessary to support execution of awards for prior years.
3. High Performance Computing work package funding is not available for new awards as this is a Congressionally directed activity.
4. Cooperative Research work package funding is not available for new awards as the activities in this work package support ongoing industry projects (such as the EPRI and NRC CRADAs).
5. MFC Research Collaboration Building work package funding is not available for new awards as this is a directed investment.
6. Materials in a Radiation Environment (MRE) Synchrotron Facility work package funding is not available for new awards as this is a directed investment.
7. Capabilities Coordination work package funding is not available for new awards as this is a DOE directed activity.
8. Office of Technology Transition Awards work package funding is not available for new awards as these activities are directed by DOE.
9. GAIN work package funding is not available for new awards as this is a directed activity.

The items listed below are not included in the **Allocated for New Awards** column. None of the associated funding is considered an allocation for new awards for the following reasons:

1. Activities within the Program Office control account do not directly support execution of awarded projects.
2. Activities within the Sample Library work package support expansion of the Nuclear Fuels and Materials Library.
3. Management Reserve is held for execution of prior awards.
4. Activities within the Combined Materials Experiment Toolkit (CoMET) work package support integration of the NSUF databases (e.g., NEID and NFML), RTE proposal system, and the development of an experiment wizard tool which support the solicitation process.
5. Activities within the Scientific Expertise work package offer INL instrument scientists the opportunity to develop new methodologies and expertise.
6. Activities within the ORNL Infrastructure work package increase research capability.

Table 1. New award allocation data.

WBS	NEET NSUF Program WBS Element Description FY 2019 Year-End	FY19 Allotments	Available for New Awards	Allocated for New Awards
3.04	**NEET National Scientific Users Facility (NSUF)**	**44,000,000**	**27,848,933**	**16,001,934**
3.04.01	**Management and Integration**	**1,947,292**		
3.04.01.01	**DOE-HQ Program Management**	**1,767,292**		
3.04.01.01	DOE-HQ Program Management - INL (Holding Account)	-		
3.04.01.01	DOE-HQ Program Management - ORNL (Holding Account)	-		
3.04.01.01	National Nanotechnology Coordination Office - DOE-CH	1,897		
3.04.01.01	NSUF Program Taxes	109,779		
3.04.01.01	NSUF SBIR/STTR Taxes	1,606,000		
3.04.01.01	NSUF Program Management Reserves	-		
3.04.01.01	Program Level HQ Directed Activities (Outplant Support) - INL	49,616		
3.04.01.02	**Program Controls**	**180,000**		
3.04.01.02	Program Controls - Management of PICS:NE	180,000		
3.04.02	**NSUF Activities**	**28,847,774**		
3.04.02.01	**Program Office**	**5,568,947**	**5,568,947**	**-**
3.04.02.01	Program Management	2,016,947	2,016,947	
3.04.02.01	Outreach, Solicitations and Technical Oversight	3,477,000	3,477,000	
3.04.02.01	NSUF Users Meeting	75,000	75,000	
3.04.02.02	**Awarded Research**	**19,483,649**	**8,750,914**	**4,793,000**
3.04.02.02	University and National Laboratory Partner Subcontracts	1,193,000	1,193,000	1,193,000
3.04.02.02	PIE Coordination	933,106	-	-
3.04.02.02	Pre CINR PIE Projects	-	-	-
3.04.02.02	Rapid Turnaround Experiments/Beamline	3,600,000	3,600,000	3,600,000
3.04.02.02	Irradiation Coordination	1,799,629	-	-
3.04.02.02	Pre CINR Irradiation Projects	-	-	-
3.04.02.02	Nuclear Fuels and Materials Library (NFML)	1,200,000	1,200,000	
3.04.02.02	High Performance Computing	8,000,000	-	-
3.04.02.02	Combined Materials Experiment Toolkit (CoMET)	755,304	755,304	
3.04.02.02	Management Reserves at INL for NSUF Activities	2,002,610	2,002,610	-
3.04.02.03	**Cooperative Research**	**329,041**		
3.04.02.03	Industry Programs	329,041		
3.4.02.04	**Capabilities**	**700,000**	**200,000**	
3.04.02.04	MFC Research Collaboration Building	-		
3.04.02.04	BRR Cask	-		
3.04.02.04	Materials in a Radiation Environment Synchrotron Facility	500,000		
3.04.02.04	Activated Materials Laboratory	200,000	200,000	
3.04.02.05	**Infrastructure Management**	**736,999**	**520,000**	**-**
3.04.02.05	Capabilities Coordination	216,999	-	-
3.04.02.05	INL Infrastructure Investment	520,000	520,000	-
3.04.02.05	ORNL Infrastructure Investment (BRR, LAMDA)	-	-	-
3.04.02.06	**FY15 New Awards**	**-**		
3.04.02.06	Boise 15-8242 PIE	-		
3.04.02.06	INL JD 15-8389	-		
3.04.02.07	**FY 2016 New Awards**	**-**		
3.04.02.07	BSU / Purdue JW 16-10181 (Westinghouse / CAES)	-		
3.04.02.07	Michigan JZ 16-10200 Ion Irradiation (MIBL)	-		
3.04.02.07	Michigan ZJ 16-10200 PIE (LAMDA)	-		
3.04.02.07	Michigan FG 16-10432 Implantation / Irradiation (MIBL)	-		
3.04.02.07	CSM JK 16-10584 PIE (MFC / CAES)	-		
3.04.02.07	ORNL TG 16-10764 Ion Implementation (MIBL)	-		
3.04.02.07	ORNL TG 16-10764 Irradiation (HFIR)	-		
3.04.02.07	ORNL TG 16-10764 PIE (LAMDA)	-		
3.04.02.07	ORNL YK 16-10468 Irradiation (HFIR)	-		
3.04.02.07	ORNL YK 16-10468 PIE (LAMDA)	-		
3.04.02.07	Idaho State HW 16-10537 PIE (MFC / CAES)	-		
3.04.02.07	GE Hitachi MC 16-10393 PIE (MFC/CAES)	-		
3.04.02.07	ORNL PE 16-10737 PIE (LAMDA / CAES)	-		
3.04.02.07	Oregon State JT 16-10480 Irradiation (UW)	-		
3.04.02.08	**Scientific Expertise**	**1,600,138**	**1,600,138**	**-**
3.04.02.08	Scientific Expertise at INL	1,600,138	1,600,138	-
3.04.02.09	**New Initiatives**	**-**	**-**	**-**
3.04.02.09	International Collaboration - INL	-	-	-

WBS	NEET NSUF Program WBS Element Description FY 2019 Year-End	FY19 Allotments	Available for New Awards	Allocated for New Awards
3.04.02	**NSUF Activities (continued)**			
3.04.02.10	**FY 2017 New Awards**	**-**		
3.04.02.10	Penn State MT 17-12797 Irradiation (IVEM)	-		
3.04.02.10	ORNL LT 17-13050 ORNL PIE (LAMDA)	-		
3.04.02.10	Boise YZ 17-12527 Irradiation (NCSUR, MITR)	-		
3.04.02.10	Pittsburgh KC 17-13073 Irradiation (MITR)	-		
3.04.02.10	Pittsburgh KC 17-13073 PIE (MCOE)	-		
3.04.02.10	Gen Atomics CD 17-12573 Irradiation (HFIR)	-		
3.04.02.10	Gen Atomics CD 17-12573 PIE (LAMDA)	-		
3.04.02.10	LANL TL 17-13004 Irradiation (UW-IBL, MIBL)	-		
3.04.02.10	AREVA JS 17-13007 Irradiation (HFIR)	-		
3.04.02.10	AREVA JS 17-13007 PIE (IMET)	-		
3.04.02.10	EPRI KY 17-12985 Irradiation (ATR)	-		
3.04.02.10	EPRI KY 17-12985 Irrad (ORNL-IFEL)	-		
3.04.02.10	EPRI KY 17-12985 PIE (HFEF)	-		
3.04.02.10	INL 17-12976 JH PIE (HFEF)	-		
3.04.02.10	Westinghouse PX 17-13106 PIE (MCOE)	-		
3.04.02.10	University of Illinois JS 17-13211 PIE (HFEF)	-		
3.04.02.10	EPRI AK 17-13088 PIE (PNNL)	-		
3.04.02.11	**FY 2018 New Awards**	**429,000**		
3.04.02.11	Texas A&M SM 18-14741 (ATR)	-		
3.04.02.11	Texas A&M SM 18-14741 (HFEF)	-		
3.04.02.11	Notre Dame YZ 18-14730 (MITR, MIBL)	-		
3.04.02.11	Ohio State MK 18-14749 (OSURR, WIBL)	-		
3.04.02.11	Aeroprobe CC 18-14788 Irrad (ATR)	-		
3.04.02.11	Aeroprobe CC 18-14788 PIE (HFEF)	-		
3.04.02.11	Florida AA 18-14704 PIE (HFEF)	-		
3.04.02.11	ORNL KF 18-14717 PIE (LAMDA)	-		
3.04.02.11	ORNL KF 18-14717 Irradiation (MIBL)	-		
3.04.02.11	INL CS 18-14772 PIE (HFEF/Westinghosue)	-		
3.04.02.11	PNNL RP 18-14787 Irradiation (TAMU)	-		
3.04.02.11	PNNL RP 18-14787 PIE (HFEF)	-		
3.04.02.11	MIT JL 18-14783 Irradiation (HFIR)	429,000		
3.04.02.11	MIT JL 18-14783 PIE (LAMDA)	-		
3.04.02.11	MIT JL 18-14783 PIE (HFEF)	-		
3.04.02	**FY 2019 New Awards***	**11,208,934**		
3.04.02.12	**FY 2019 New Awards**	**11,208,934**	**11,208,934**	**11,208,934**
3.04.02.12	FY 2019 New Awards - ORNL	6,094,844	6,094,844	6,094,844
3.04.02.12	FY 2019 New Awards - INL	5,114,090	5,114,090	5,114,090
3.04.04	**Office of Technology Transition Awards - DOE-HQ**	**396,000**		
3.04.04.01	**Office of Technology Transition Awards - DOE-HQ**	**396,000**		
3.04.04.01	Office of Technology Transition Awards - DOE-HQ (Complete)	-		
3.04.04.01	Office of Technology Transition Awards - INL	-		
3.04.04.01	Office of Technology Transition Awards - ORNL	-		
3.04.04.01	Office of Technology Transition Awards - ANL	250,000		
3.04.04.01	Office of Technology Transition Awards - LLNL	146,000		
3.04.05	**GAIN Management**	**1,600,000**		
3.04.05.01	**GAIN Management**	**1,600,000**		
3.04.05.01	NSUF Contributions to GAIN - INL	1,600,000		
3.04.05.01	NSUF Contributions to GAIN Management (Third Way) - DOE-ID	-		
3.04.05.01	NSUF Contributions to GAIN Management - ANL	-		
3.04.05.01	NSUF Contributions to GAIN Management - ORNL	-		
3.04.05.01	NSUF Contributions to GAIN Management - SNL	-		
	NSUF PICS:NE Total	**44,000,000**	**27,848,933**	**16,001,934**

* - New award funding for non-national laboratory partners flows through INL.

For FY 2019, $27,848,933 were available for new awards and $16,001,934 were allocated for new awards. This means 57% of available annual funding was applied to new research awards. The data are presented graphically in Figure 1.

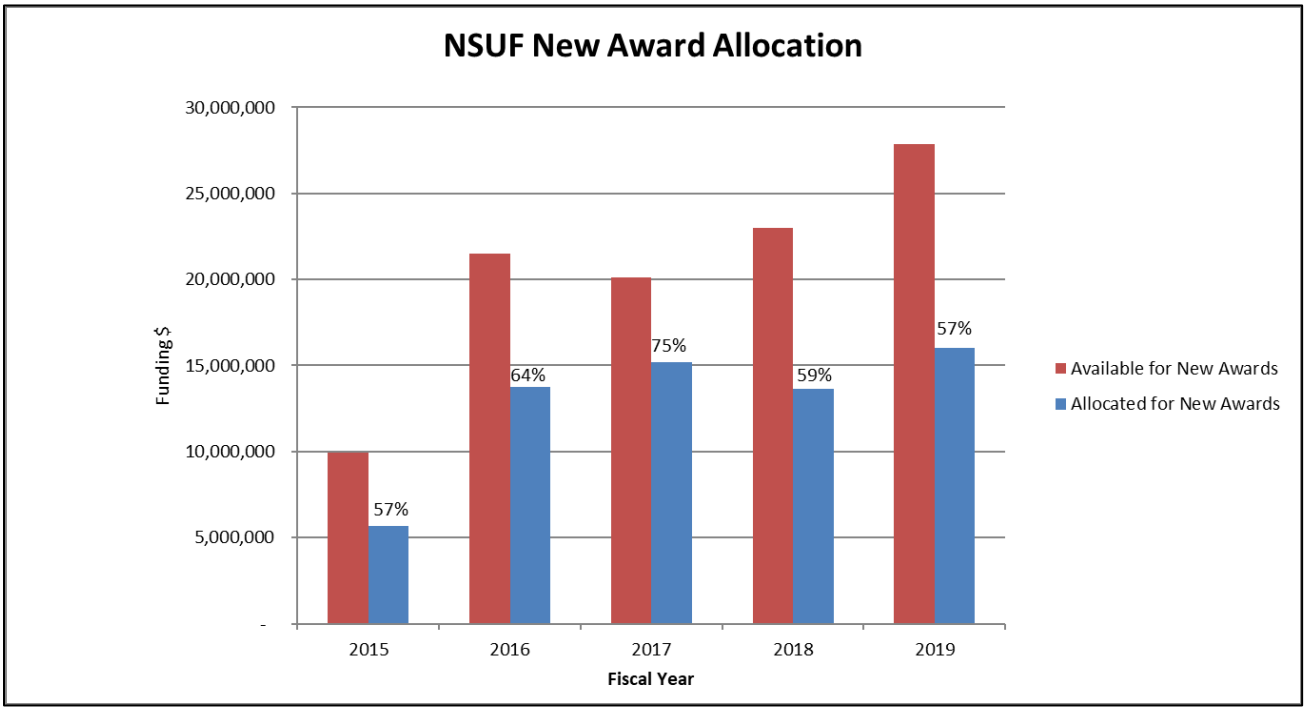

Figure 1. NSUF new award allocation.

NSUF-Awarded Research Analysis and Conclusions

The percentage of available annual funding being applied to new research awards remained essentially the same from FY 2018 to FY 2019. The dollar amount of new budget authority (BA) funding allocated to new awards increased by $2.3M, primarily due to the increase in funding available for new awards. Over the last three years, the dollar amount of funding available for new awards has steadily increased, however, the amount allocated to new awards has remained relatively flat. This trend reflects a planned increase in NSUF investments, while maintaining a healthy new award allocation, as detailed in the NSUF strategic plan.

Metric:

- The goal of 50% for new award allocation was exceeded.

Conclusions:

The NSUF continues to keep administrative costs and investments in a proper balance with new awarded research projects. It should be noted that the NSUF awarded a total of over $21M in new awards between RTE and CINR projects when carry over funds are included. The $21M represents an all-time high in new award funding for the NSUF and is a clear indication of the NSUF's drive to provide as many resources as possible to the nuclear energy research community.

End Section I. NSUF-Awarded Research

II. NSUF Partner Utilization

Metric Objective: Effectively utilize NSUF capabilities by providing researchers access to a variety of capabilities.

Performance Metric: Percentage of new awards (by funding) executed at partner facilities.

Performance Goal: 20%; subject to change based on final award ranking and preferred capability for awarded scope of work.

FY 2019 partner utilization data are taken directly from the FY 2019 final award budgets. Figure 2 and Table 2 present CINR partner facility utilization from the perspective of the total estimated cost of awarded CINR proposals and the estimated cost awarded to NSUF partners, excluding CAES MaCS. CAES MaCS CINR partner costs have been excluded from the total because specific award amounts are not associated with CAES MaCS access. CAES MaCS is funded on an annual basis, not on a set project basis; this funding covers overall CINR and RTE support.

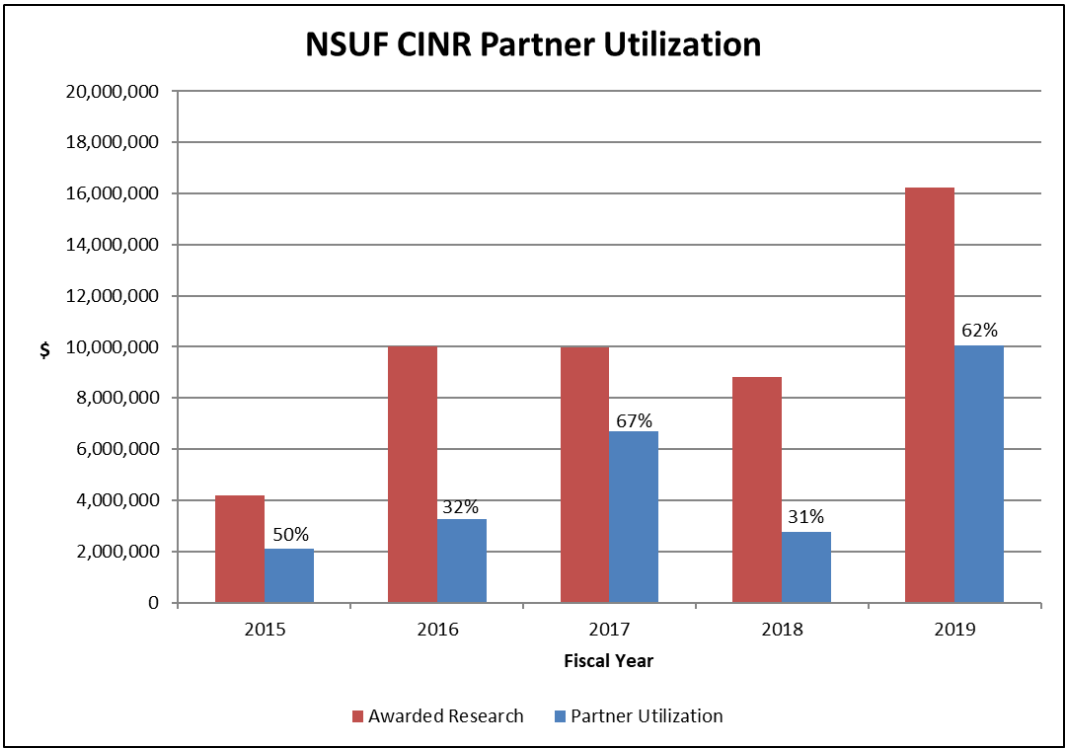

Figure 2. CINR partner utilization by funding.

Table 2. CINR partner utilization data by funding.

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	Total
Partner Utilization	$2,101,116	$3,248,208	$6,713,248	$2,754,504	$10,047,222	$24,864,298
Awarded Research	$4,201,907	$10,000,000	$9,973,909	$8,837,886	$16,216,249	$49,229,951
% Partner Utilization	50%	32%	67%	31%	62%	51%

Figure 3 and Table 3 present RTE partner facility utilization from the perspective of award value. Beginning in FY 2017, cost estimates were obtained for all RTE proposals. This allows for a better representation of partner utilization than was possible for previous metrics reports that utilized RTE award numbers. RTE awards that utilize multiple facilities are now accounted for properly. The award values include the costs of CAES utilization.

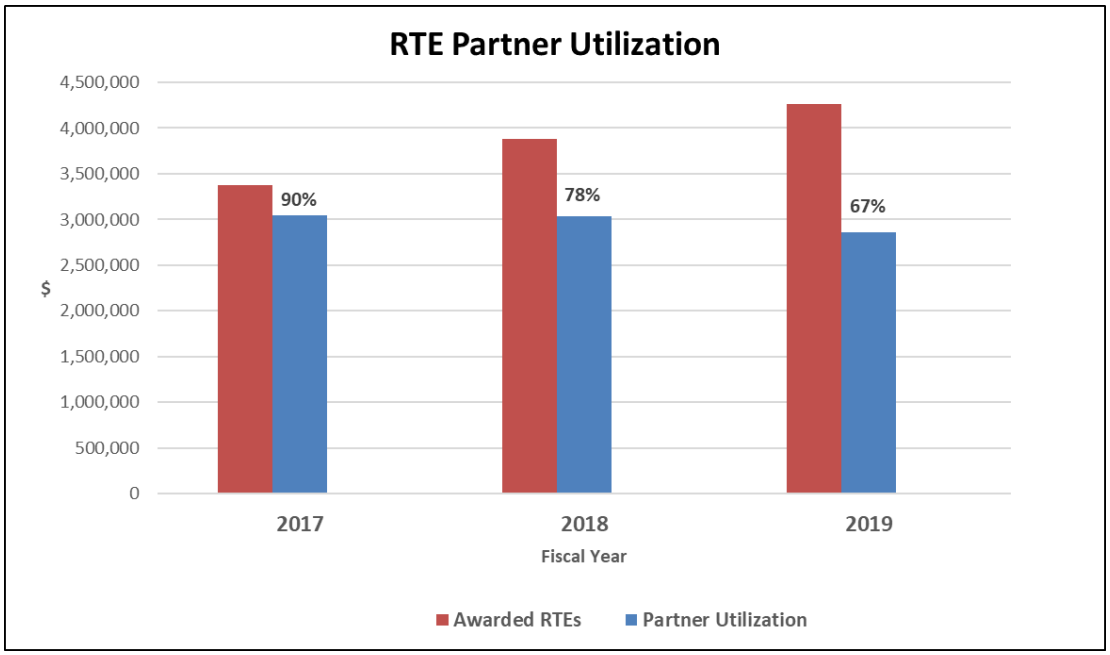

Figure 3. NSUF RTE partner awards.

Table 3. RTE partner utilization by funding.

	FY 2017	FY 2018	FY 2019	Total
Partner Utilization	$3,048,213	$3,038,020	$2,856,268	$8,942,501
Awarded Research	$3,380,357	$3,881,870	$4,260,918	$11,523,145
% Partner Utilization	90%	78%	67%	78%

NSUF Partner Utilization Analysis and Conclusions

In FY2019, nine CINR projects were awarded with six of those awards utilizing partner facilities. Partner utilization increased from 31% in FY 2018 to 62% in FY 2019. The CINR award amount for FY 2019 almost doubled from FY 2018 and included two large irradiation projects at ORNL. As for previous years, the mix of large irradiation projects, whether at INL or partners, is the main factor driving this metric and is heavily influenced by the quality and associated review score of the proposals received.

In FY 2019, MFC was utilized in about 33% of the RTE awards with the balance of the awards utilizing the remaining partners. For the partner utilization, three partner facilities (IVEM, CAES MaCS, and LAMDA) represent approximately 50% of the overall facility utilization with the remaining 16 partners accounting for 17% of the utilization. The dollar amount of MFC utilization for RTEs has steadily increased over the last three years from $332K in FY 2017 to $1.4M in FY 2019.

Metric:

- The percentage of CINR awards being executed at partner facilities continues to exceed the goal but varies from year to year depending on the number and location of large irradiation projects.
- The percentage of RTE awards being executed at partner facilities continues to exceed the goal.

Conclusions:

The NSUF is effectively utilizing its partner capabilities. INL is the lead and primary laboratory of the NSUF. An appropriate balance in the utilization of INL and partner facilities needs to be maintained during the selection process. The steady increase in utilization of INL capabilities is very positive and reflects the user community's desire to perform research in INL's Irradiated Material Characterization Laboratory at the Materials and Fuels Complex.

End Section II. NSUF Partner Utilization

III. Infrastructure Support Prioritization

Metric Objective: Support NE on management decisions related to infrastructure support prioritization.
Performance Metric: Percentage of infrastructure support awards that address priorities and gaps identified in the infrastructure database.
Performance Goal: At least 50% of annual awards address priorities and gaps identified in the infrastructure database.

The NSUF provides support for the DOE-NE CINR infrastructure grant program, including organization, reviews, and data collection and analysis. In addition, the NSUF uses a variety of information sources, including the Nuclear Energy Infrastructure Database (NEID) to perform an annual gap analysis for nuclear energy supporting R&D infrastructure. This metric measures the proportion of identified gaps that have been addressed by infrastructure awards. Two R&D capability areas have been identified as needing additional investment. These are (1) radioactive material characterization and examination facilities and (2) research and test reactors (and other neutron sources). Figure 4 graphically shows the infrastructure award total funding levels, including the amount and percentage awarded for identified gaps since FY 2015.

The data in Table 4 and Figure 4 show that the NSUF had met the goal of at least 50% of the annual awards addressing infrastructure priorities and gaps from FY 2015 to FY 2018. The performance in FY 2019 is at 48%.

For FY 2019 and beyond, the NSUF will continue to advocate for the proposals that fill the identified infrastructure gaps.

Table 4. Cost of DOE-NE infrastructure awards (FY 2015–2019). Values given in $M.

Infrastructure Award Funds	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Addressing Gaps	$2.42	$4.96	$4.53	$4.62	$0.88
Not Addressing Gaps	$2.11	$0.97	$1.40	$0.34	$0.94
Total Funds Awarded	$4.54	$5.93	$5.93	$4.96	$1.81
% Addressing Gaps	53%	84%	76%	93%	48%

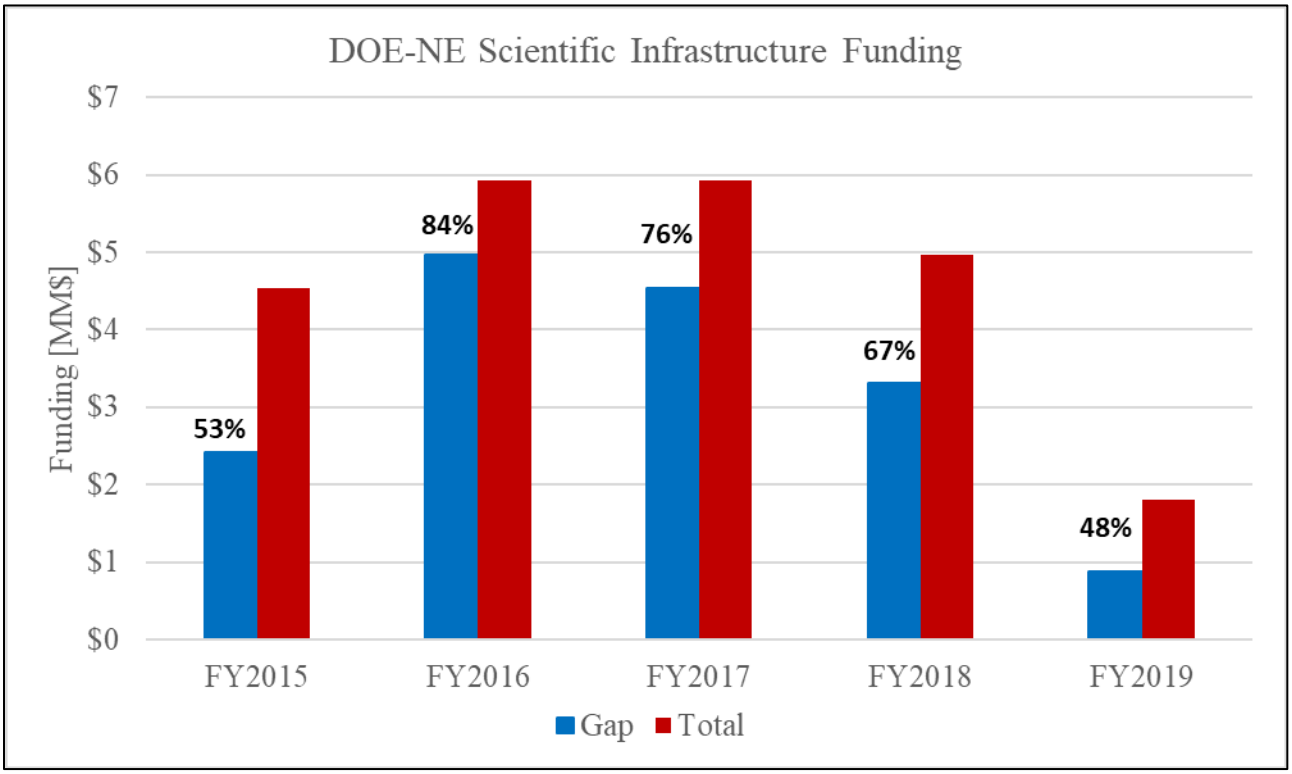

Figure 4. Cost of DOE-NE infrastructure awards targeted to identified gaps.

Infrastructure Support Prioritization Analysis and Conclusions

In FY 2019, DOE-NE provided $1,679,280 in funding to support university infrastructure. The infrastructure funding opportunity is split into two work scopes: university Research Reactor Upgrades (RU) and university General Scientific Infrastructure (GSI).

Each work scope has its own planned budget and merit review process. Reviews, rankings, and selections are performed within each work scope, although balancing can be performed by the DOE Selection Officer across the two work scopes.

In order to assess program performance with respect to identified gaps, the NSUF differentiates scientific infrastructure into several categories based on the capabilities. A single proposal may fall into one or more of these categories. The proportion of proposals that fit within each category is fully dependent on the applicants, although a focused call could influence the outcome. The FY 2019 gap analysis report was released on June 28, 2019 and informed the specific areas requested in the FY 2020 CINR Infrastructure FOA. The NSUF will continue to use the gap analysis to focus the university scientific infrastructure FOA towards identified capability gaps.

Table 5 shows the infrastructure categories and the funding associated with awarded proposals for the last five years.

Table 5. Funding awarded by infrastructure area (FY 2015–2019).

Infrastructure Area	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Awards Addressing Gaps (FY15–19 Categories)					
Reactor & Neutron Sources	$1,207,382	$3,025,337	$2,083,504	$3,481,749	$334,000
Materials Characterization	$1,216,718	$1,670,472	$790,706		$501,294
Mechanical Testing			$411,657	$1,137,734	
Thermal-Hydraulic Facilities	$245,000	$490,791	$1,246,405		
Gap Subtotal	$2,424,100	$4,960,784	$4,532,272	$4,619,483	$835,294
Awards Not Directly Addressing Gaps (FY15–19 Categories)					
Ion Beam Facilities		$264,975			
Advanced Instrumentation	$552,200	$125,000	$274,973		
Advanced Manufacturing	$106,816	$125,000	$675,317	$184,505	
Radiochemistry Laboratories	$32,925	$116,500			
Hot Cells & Containment		$107,875			
Instrumentation and Controls	$747,973				
Light Source (X-rays)	$426,300		$450,000	$154,065	
Shipping Casks (UNF)					
Concrete and Seismic					
Reactor Simulation					$843,986
Non-Gap subtotal	$2,111,214	$965,166	$1,400,288	$338,570	$843,986
Total Funding	$4,535,313	$5,925,949	$5,932,560	$4,958,053	$1,679,280
Percentage of Funds Addressing Gaps	53%	84%	76%	93%	48%

Analysis:

While the NSUF supports and administers the DOE-NE Scientific Infrastructure grant program, the NSUF does not make the final proposal award decisions. The NSUF assists in the process and provides technical reviews and funding recommendations. The NSUF provides reviews for these proposals in four areas: NSUF Priority, Impact, Utilization, and Project Execution in accordance with the merit review plan associated with the FOA. The NSUF supplied a single technical review for all proposals in each work scope.

DOE-NE and DOE-ID perform the actual selection process and may choose to award proposals other than those recommended by the NSUF for funding, as allowed by section V.A.3 of the FOA. FY 2019 Reactor Upgrade awards were made in accordance with the merit review panel recommendations, but the General Scientific Infrastructure award recommendations were not followed based on Selection Officer (SO) discretion, with the SO selecting projects important to DOE-NE, but not to the NSUF program. These alternative selections contributed to the NSUF missing its performance metric for FY 2019.

The planned budget of the FY 2019 CINR Infrastructure FOA was $5,000,000. This amount was later readjusted based on external factors with only $1,679,280 ultimately available for awards. The lower budget

led to fewer awards, which may have also contributed to the NSUF missing this performance metric for FY 2019.

Although the NSUF administers the process, performs technical reviews, and assists in making recommendations for the infrastructure solicitations, since the NSUF does not control the final selection of awards, the metric is not a good reflection of the NSUF's performance. Because of this challenge, the NSUF recommends that this metric either be removed as a metric or converted to reflect the recommendations the NSUF assists in making.

Metric:

- For FY 2019, 48% of annual awards address priorities and gaps identified in the infrastructure database, not meeting the goal of 50%

Conclusions:

The NSUF recommends that this metric either be removed as a metric or converted to reflect the recommendations the NSUF assists in making. If the metric is changed to recommendations, then the NSUF also recommends that the national laboratory infrastructure investments also be included in this metric since those investments are directly informed by the Annual NSUF NE R&D Capability Gap Analysis report.

End Section III. Infrastructure Support Prioritization

IV. Publications/Conference Proceedings

Metric Objective Publicize and document research results through publication in high-impact-factor peer-reviewed journals and conference presentations.

Performance Metric: Number of peer-reviewed publications and conference proceedings per year.

Performance Goal: Minimum of 20 journal publications or conference proceedings per year.

The NSUF publications and conference presentations are reported by calendar year. Figure 5 and Table 6 show the number of NSUF supported peer-review publications and conference presentations for 2015 to 2019 as known at the time of preparation of this metrics report.

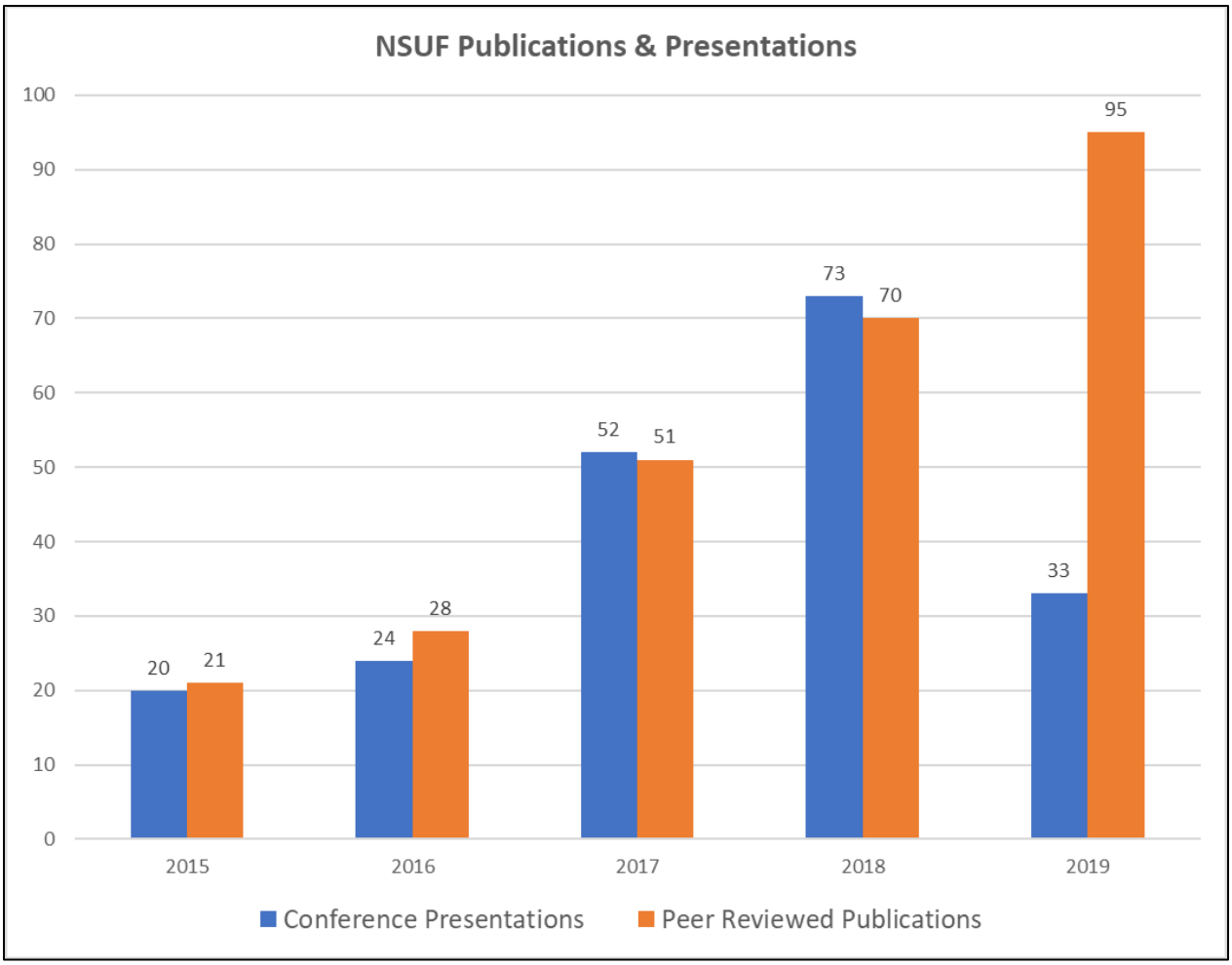

Figure 5. NSUF publications/conference presentations.

Table 6. Data for NSUF publications/conference presentations.

	CY 2015	CY 2016	CY 2017	CY 2018	CY 2019
Conference Presentations	20	24	52	73	33
Peer-Reviewed Publications	21	28	51	70	95

NSUF Publications/Conference Presentations Analysis and Conclusions

Historically, the NSUF gathered the data for this metric from principal investigators as works cited during the proposal application processes and through web searches. Henceforth, to provide a more rigorous count for the metric, the numbers of peer-reviewed publications will be taken from the Clarivate Analytics "Web of Science" database utilizing a search for all publications acknowledging NSUF support. In Figure 5 peer-reviewed publications includes some, but not all, conference proceedings. The number of peer reviewed publications shows continuous growth from 21 in 2015 to 95 in 2019. While the actual numbers in the figure and table differ somewhat from those self-reported by the NSUF principal investigators, the underlying growth is the same. Discrepancies arise from principal investigators reporting work as supported by the NSUF, but not providing an acknowledgement in the publication.

Metric:

- For FY 2019, the 95 journal publications alone significantly exceeded the goal of 20 journal publications or conference proceedings.

The NSUF tracks and reports the number of conference presentations given by principal investigators on NSUF supported research even though this number is not a required metric. The number of conference presentations self-reported by principal investigators increased from 20 in 2015 to 73 in 2018 but dropped to only 33 in 2019. The reason for this decrease is not clear but it appears the dataset is incomplete. The NSUF program office is performing an in-depth examination to determine the cause.

Conclusions:

The NSUF continues to produce impactful results as can be observed in the increasing number of peer reviewed publications. The Journal of Nuclear Materials is by far the journal in which the NSUF research is most published and is the most important journal for the NSUF and broader nuclear fuels and materials research community.

End Section IV. Publications/Conference Proceedings

V. Prominence/Positive Exposure for NSUF

Metric Objective: Increase the prominence and positive exposure of the NSUF in the research community. This may be a temporary objective until we reach a saturation point, at which point the goal may be to "maintain."

Performance Metric: Number of invited lectures, plenary lectures, keynote addresses, promotions, awards, PhD dissertations, etc. resulting from NSUF project work or highlighting NSUF opportunities and capabilities.

Performance Goal: 5% increase over previous yearly average.

FY 2019 data for this measure were gathered directly from required quarterly reports and emails from principal investigators. Table 7 provides information on the FY 2018 and FY 2019 performance.

Table 7. FY 2018 and 2019 invited lectures, plenary lectures, keynote addresses, promotions, awards, PhD dissertations, etc. resulting from NSUF project work or highlighting NSUF opportunities and capabilities

Prominence/Positive Exposure for NSUF		
FY 2019		
1.	Best poster within the ATF topic track and honorable mentions for best overall poster, "Mechanical and Hermetic Performance of SiC-SiC Joints in Representative Cladding Geometries," NuMat2018: The Nuclear Materials Conference, October 14-18, 2018, Seattle, WA.	C. Deck
2.	Invited talk: "Microscopy and microanalysis of nuclear fuels," presented at 2018 Materials Science & Technology meeting, Columbus, OH, October 14-18, 2018.	A. Aitkaliyeva
3.	Invited talk: "Physically Based Low Flux-High Fluence RPV Steel Embrittlement Models," Materials Science and Technology presented at 2018 Materials Science & Technology meeting, Columbus, OH, October 14-18, 2018.	G.R. Odette, T. Yamamoto, P. Wells, N. Almirall, R. Nanstad
4.	Invited talk: "The US Nuclear Science User Facilities," presented to the Japan Ministry of Education, Culture, Sports, Science and Technology (MEXT), November 12, 2018.	D. Ogden
5.	Invited Graduate Seminar: "Neutron Irradiation Challenges and Opportunities in Nuclear Energy Research and Development," presented to the Department of Nuclear Engineering Graduate Seminar, University of Michigan, Ann Arbor, MI, November 30, 2018; presented to the Department of Physics Graduate Seminar, University of Idaho, Moscow, ID, April 8, 2019; and presented to the Department of Nuclear Engineering Graduate Seminar, Pennsylvania State University, University Park, PA, July 22, 2019.	B. Heidrich
6.	Invited talk: "DOE Nuclear Science User Facility Program" presented at the Molten Salt Reactors Technology Working Group Meeting," Nuclear Energy Institute, Washington D.C., December 2018.	S. Pimblott
7.	PhD student thesis in Nuclear Science and Engineering, Massachusetts Institute of Technology, Y. Yang, December 2018.	Y. Yang
8.	Doctor of Philosophy in Materials Science, "Investigation of thermal degradation in structural alloys for nuclear power systems," Oregon State University, presented on December 7, 2018.	F. Teng
9.	Session chair for "In-Pile Instrumentation Development at INL" and "Advanced Instrumentation" at the 11th Nuclear Plant Instrumentation, Control and Human-Machine Interface Technologies American Nuclear Society (ANS) conference, Orlando, FL, February 2019.	B. Heidrich
10.	Contributed talk at "Radiolytic Damage at Carbide-Water Interfaces, Advanced Accident and Radiation Tolerant Materials," Cambridge, UK, February 2019.	S. Pimblott
11.	Invited lecture: "Recent progress in testing and qualification of PM-HIP alloys for nuclear applications," TMS Annual Meeting, San Antonio TX, March 2019.	J. P. Wharry, M. J. Pavel, Z. T. Kroll, E. Bautista, A. Bullens, D. P. Guillen, L. A. Giannuzzi, E. Getto, D. Pagan, P. D. Freyer, D. W. Gandy
12.	Invited talk: "Effect of Friction Stir Welding on Microstructure Evolution on -Ion Irradiated MA956," at the Materials Society Annual Meeting & Exhibition 2019, San Antonio, Texas, March 10-14, 2019.	E. Getto, B. Tobie, S. Briggs, K. Hattar, B. Baker
13.	Keynote lecture: "Neutron Irradiation Effects on The Microstructure of Nuclear Graphite," TMS 2019, San Antonio, TX, March 10-14, 2019.	J. Arregui-Mena, P. Edmondson, R. Worth, C. Contescu, T.

		Burchell, D. Cullen, Y. Kato
14.	Invited talk: “Irradiation Effects on Precipitation in Multiconstituent Steels,” TMS 2019, San Antonio, TX, March 11-15, 2019.	G.R. Odette, N. Almirall, P. Wells, T. Yamamoto, E. Marquis, S. Shu, D. Morgan, J.H. Ke, H. Ke
15.	Invited talk: “A New RPV Steel Low Flux-High Fluence Embrittlement Model for the US Surveillance Database,” TMS 2019, San Antonio, TX, March 11-15, 2019.	G.R. Odette, T. Yamamoto, P. Wells, N. Almirall
16.	Invited talk: “In situ irradiation and heating of synthetic SiC and implications for the origins of C-rich circumstellar materials,” at the 50th Lunar and Planetary Science Conference, abstract #2127, Houston, TX, March 21, 2019.	T.J. Zega, J. Bernal, J.Y. Howe, P. Haenecour, S. Amari, L.M. Ziurys
17.	Organized an NSUF symposium at the April 2019 American Nuclear Society Student Meeting.	S. Pimblott, B. Heidrich
18.	PhD dissertation: “Influence of irradiation and laser welding on deformation mechanisms in 304 austenitic stainless steels,” Materials Engineering, Purdue University, May 2019.	K. S. Mao (PhD student)
19.	PhD dissertation: “In situ TEM mechanical testing of irradiated oxide dispersion strengthened alloys,” Materials Engineering, Purdue University, May 2019.	K. H. Yano (PhD student)
20.	Member of the Scientific Committee for the European Materials Research Society (E-MRS) Nuclear Materials Symposium, Nice, France, May 2019.	J. R. Kennedy
21.	Invited lecture: “Irradiation Damage Behavior in Novel High-Entropy Carbide Ceramic,” 2019 American Nuclear Society (ANS) Annual Meeting, Minneapolis, Minnesota, June 10, 2019.	C. Bai
22.	Chaired Isotopes and Radiation Division General Session and three Irradiation Experiments Sessions at the 2019 Annual Meeting of the American Nuclear Society, Minneapolis, MN June 9-13, 2019.	B. Heidrich
23.	Organized and chaired two session for “NSUF Research” at the 2019 ANS Annual Meeting, Minneapolis, MN, June 2019.	J. R. Kennedy
24.	Contributed talk “Development of the FaMUS Methodology for Quantifying Materials Understanding and its Application to the NSUF,” ANS Annual Meeting, Minneapolis, MN, USA, June 2019.	S. Pimblott
25.	Chaired Accident Tolerant Fuels – I session at the 2019 ANS Annual Meeting, Minneapolis, MN, June 2019.	J. R. Kennedy
26.	Invited panelist: “Challenges Associated with Material Transport into and Waste Removal from Hot Cell R&D Facilities Worldwide,” ANS Annual Meeting, Minneapolis, MN, June 2019. (declined due to schedule conflict).	J. R. Kennedy
27.	Invited talk: “The US Nuclear Science User Facilities,” presented to the Czech Republic Delegation, June 12, 2019.	D. Ogden
28.	TMS Best Paper Award – Graduate Division, 2nd place, July 2019.	K. Mao
29.	Invited lecture: “The Nuclear Science User Facilities (NSUF),” MeV School, ORNL, Knoxville, TN, July 2019.	S. Pimblott
30.	Organized the University Research Reactor Fitness Workshop at the Center for Advanced Energy Studies, Idaho Falls, ID, July 16-17, 2019.	B. Heidrich
31.	Invited lecture: “Role of irradiation and weld-induced post-irradiation annealing on deformation mechanisms in 304L stainless steel,” 10th Pacific Rim International Conference on Advanced Materials and Processing (PRICM-10), Xi'an China, August 2019.	J. P. Wharry, K. S. Mao, C. Sun, P. D. Freyer, F. A. Garner
32.	Organized and chaired Session at the 19th International Conference on Environmental Degradation of Materials in Nuclear Power Systems—Water Reactors, August 2019, Boston, MA.	S. Pimblott
33.	PhD dissertation: “Development and characterization of nanostructured steels and high entropy alloys for nuclear applications,” Nuclear Engineering Department, Missouri University of Science and Technology, August 2019.	A. Hoffman (PhD student)
34.	Invited talk: “Putting stars in the gap: In situ irradiation and heating of synthetic SiC and Implications for the origins of C-rich circumstellar materials. Microscopy and Microanalysis 25,” abstract #2488, Portland, OR, August 8, 2019.	T.J. Zega, J. Bernal, J.Y. Howe, P. Haenecour, S. Amari, and L.M. Ziurys
35.	PhD dissertation: “The radial evolution of microstructure and fission products in fast reactor mixed oxide fuels,” Department of Materials Science and Engineering, University of Florida, August 9, 2019.	R. Parrish (PhD student)
36.	Invited talk: “The US Nuclear Science User Facilities,” presented to the New Reactor Leadership Delegation, Massachusetts Institute of Technology (MIT), Boston, MA, September 12, 2019.	D. Ogden
37.	Invited talk: “Radiation Effects on Heterogeneous Systems,” Miller Conference, Cumbria, UK, September 2019.	S. Pimblott
38.	Keynote lecture: “Assessment of Neutron Damage in Irradiated Graphite Using Gas Adsorption Methods,” INGSM (International Nuclear Graphite Specialists Meeting), Bruges, Belgium, September 16-19, 2019.	C. Contescu, J. Spicer, N. Gallego, A.

		Campbell, J. Arregui-Mena, T. Burchell
39.	Invited talk, "Nuclear Science User Facilities (NSUF)," at the 7th Nuclear Universities Consortium for Learning, Engagement and Research Academics Discussion Meeting (NADM), Bangor University, September 2019, Bangor, UK.	J. R. Kennedy
40.	Organized session for "University Research Reactor Fitness Workshop Panel" at the National Organization of Research, Test, and Training Reactors meeting, Idaho Falls, ID, September 2019.	B. Heidrich, B. Meffert, M. Lund, J. Geuther
41.	Keynote lecture: "A Multi-Technique Image Library of Graphite Microstructures," INGSM (International Nuclear Graphite Specialists Meeting), Bruges, Belgium, Sept 16-19, 2019.	J. Arregui-Mena, C. Contescu, D. Griffiths, R. Worthm L. Margetts, P. Mummery, A. Campbell, N. Gallego, E. Cakmak, C. Hayes, T. Burchell, Y. Kato, P. Edmondson
42.	Keynote lecture: "Ultra-High Temperature Neutron Irradiation Effects on Graphite Microstructure," INGSM (International Nuclear Graphite Specialists Meeting), Bruges, Belgium, Sept 16-19, 2019.	A. Campbell, E. Cakmak, C. Contescu, N. Gallego, T. Burchell
43.	G. R. Odette was elected as a fellow of American Association for the Advancement of Science (AAAS) 2019.	G. R. Odette
44.	Member of the ANS Materials Science and Technology Division Executive Committee.	J. R. Kennedy
45.	Invited panel member for the UK Engineering and Physical Sciences Research Council (EPSRC) National Nuclear User Facility (NNUF) Phase 2 Call Review and Prioritization Panel. The panel was to make recommendations on £81.5M (>$100M) worth of infrastructure requests from UK nuclear researchers.	J. R. Kennedy
46.	The NSUF is lead for the Enabling Technologies Working Group of the US DOE – UK BEIS Nuclear Energy Research and Development Cooperative Action Plan.	J. R. Kennedy
47.	Invited lecture: Berkley Colloquium lecture at the University of California. (declined due to schedule conflict).	J. R. Kennedy
48.	U.S. Department of Energy Office of Science Early Career Award, 2019.	J. P. Wharry
49.	General Scientific Infrastructure (GSI) award to University of Nevada-Reno enabled the 2019 DARPA Young Faculty Award, "Additive Manufacturing of Functional Hierarchical Shape Memory Alloy Structures," 2019-2022.	S. Pathak
FY 2018		
1.	Invited Talk, "Radiation induced chemistry of gases in contact with oxide surfaces," 30th Miller Conference in Radiation Chemistry, Sicily, October 2017.	S. Pimblott
2.	Invited Panelist, "Need for Hot Cells for Nuclear R&D" and "Research Opportunities in Advanced Fission and Fusion Materials," at the 2017 ANS Winter Meeting and Expo, October 29-November 3, 2017, Washington, D.C.	J. R. Kennedy
3.	Session Chair for "Production and Applications of Isotopes and Radiation" at the winter 2017 American Nuclear Society meeting in Washington, DC, November 2017.	B. Heidrich
4.	Invited Talk, "The U.S. Nuclear Science User Facilities (NSUF)," OECD NEA Nuclear Science Committee Workshop, January 10, 2018, Paris, France.	J. R. Kennedy
5.	Invited Lecture, "Nanomechanical testing of irradiated materials," Department of Nuclear Science & Engineering, Massachusetts Institute of Technology, February 2018, Cambridge, MA.	J.P. Wharry, K. H. Yano, P.V. Patki, H. Qu, H. Lopez, Y. Wu, Y. Lu
6.	The NSUF had a cover feature and special NSUF section (eight articles) in the February 2018 edition of *Nuclear News.*	J. R. Kennedy
7.	3rd Place Student Poster Presentation, "Modeling of Irradiation-Induced Precipitates in Ferritic-Martensitic Alloy T91," National Society of Black Engineers Annual Convention, March 2018, Pittsburgh, PA.	S.B. Adisa, M.J. Swenson
8.	Invited panel presentation, "Microscopy and microanalysis of nuclear fuels," Presented at 2018 Materials Research Society (MRS) Spring Meeting & Exhibit, April 2-6, 2018, Phoenix, AZ.	A. Aitkaliyeva
9.	Invited Lecture, "Nanomechanical testing of irradiated materials," Nuclear Engineering & Engineering Physics, April 2018, University of Wisconsin, Madison, WI.	J.P. Wharry, K.H. Yano, P.V. Patki, H. Qu, and H. Lopez
10.	Session organizer/chair for "Applications of DOE-NE Infrastructure Support for University Research Reactors" at 2018 ANS Annual Meeting, June 17-21, 2018, Philadelphia, PA.	B. Heidrich
11.	Co-chaired two NSUF Special Sessions during the "Nuclear Fuels & Structural Materials for Next Generation Nuclear Reactors Embedded Topical" at the 2018 ANS Annual Meeting, June 17-21, 2018, Philadelphia, PA.	J. R. Kennedy
12.	Invited Talk, "Radiation track structure and the charge cycling of ions in nuclear materials," 25th Conference on the Application of Accelerators in Research and Industry, Dallas, August 2018.	S. Pimblott

13.	Invited Talk, "U.S. Nuclear Science User Facilities (NSUF): Overview and Update," Nuclear Academics Discussion Meeting (NADM), September 5, 2018, Liverpool, United Kingdom.	J. R. Kennedy
14.	National Science Foundation CAREER Award.	J. Wharry
15.	ORAU Ralph E. Powe Junior Faculty Award.	J. Wharry
16.	John J. and Jean M. Brennan Clean Energy Early Career Professor, Penn State.	N. Brown
17.	ANS Mark Mills Award for his work entitled, "Irradiation Effects in Various Advanced Structural Alloy Systems for Nuclear Systems."	X. Liu
18.	Berkeley Chancellor's Fellowship.	S. Stevenson
19.	Glenn T. Seaborg Distinguished Postdoctoral Associate at INL.	Y. Xie
20.	ANS Fellow.	L. W. Hu
21.	Chapter editor, "Big Data in Safety," in American Society of Safety Professionals, 2018, edited by R. Olawoyin and D. C. Hill, The American Society of Safety Engineers, ISBN 0939874180, 2018.	B. Heidrich
22.	ANS Isotopes & Radiation Executive Committee member.	B. Heidrich
23.	ANS-15.22 standards committee member.	B. Heidrich
24.	ANS Professional Engineering Examination Committee member.	B. Heidrich
25.	Invited Scientific Committee Position for the European Materials Research Society's Nuclear Materials Symposium.	J. R. Kennedy
26.	ANS Materials Science and Technology Division Executive Committee.	J. R. Kennedy

Prominence/Positive Exposure for NSUF Analysis and Conclusions

The prominence/positive exposure for the NSUF and the user community increased significantly in FY 2019, far exceeding the goal of 5%. This increase reflects the anticipated effect of increasing the number, size ($), and complexity of NSUF awards and publications.

Conclusions:

The prominence/positive exposure for the NSUF has continued to increase as a result of the both the quantity and quality of the research, publications, and awarded proposals.

End Section V. Prominence/Positive Exposure for NSUF

VI. Expansion and Diversification of NSUF User Community

Metric Objective: Expand and diversify the NSUF user community.
Performance Metric: Number of proposals received gauged against number/year/available funding, project type, number of new PIs, institutions, geographic distribution, and minority-serving institutions.
Performance Goal: Analyze data to identify and act upon trends, deficiencies, and exceptionalities.

To show how the NSUF is growing, Figure 6 and Table 8 provide a historical overview of the number of RTE proposals, RTE awards, CINR pre-applications, and CINR awards. In addition, a historical plot of new budget authority is provided as a reference point to show overall NSUF program funding. For this plot, new budget authority is calculated by taking the full NSUF appropriation and subtracting Congressionally directed activities and HQ taxes.

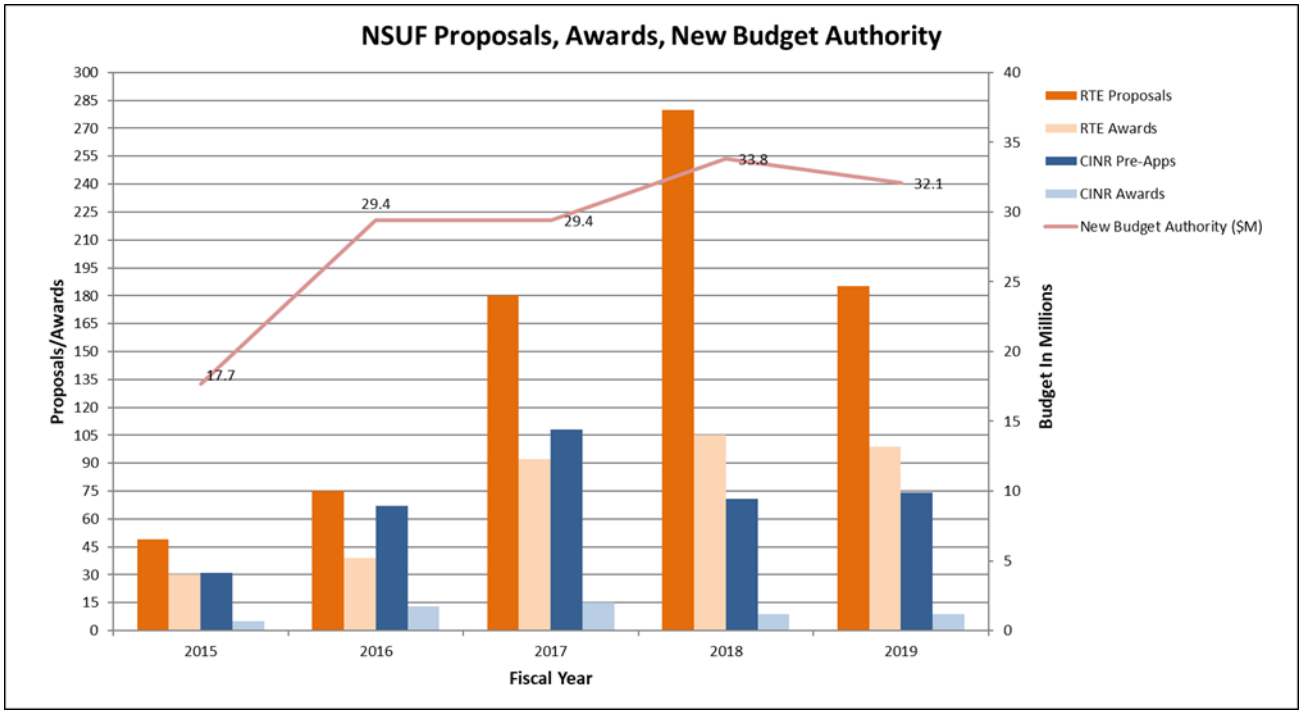

Figure 6. NSUF proposals, awards, and new budget authority.

Table 8. NSUF proposals, awards, and new budget authority ($M).

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
RTE Proposals	49	75	180	280	185
RTE Awards	30	39	92	105	99
CINR Pre-Apps	31	67	108	71	74
CINR Awards	5	13	15	9	9
New Budget Authority ($M)	17.7	29.4	29.4	33.8	32.1

To help illustrate expansion and diversification, Figure 7 and Table 9 provide an overview of the number of combined CINR and RTE awards by fiscal year made to international, national laboratory, industrial, and university institutions. A plot of the total number of PIs and new PIs per year is also provided.

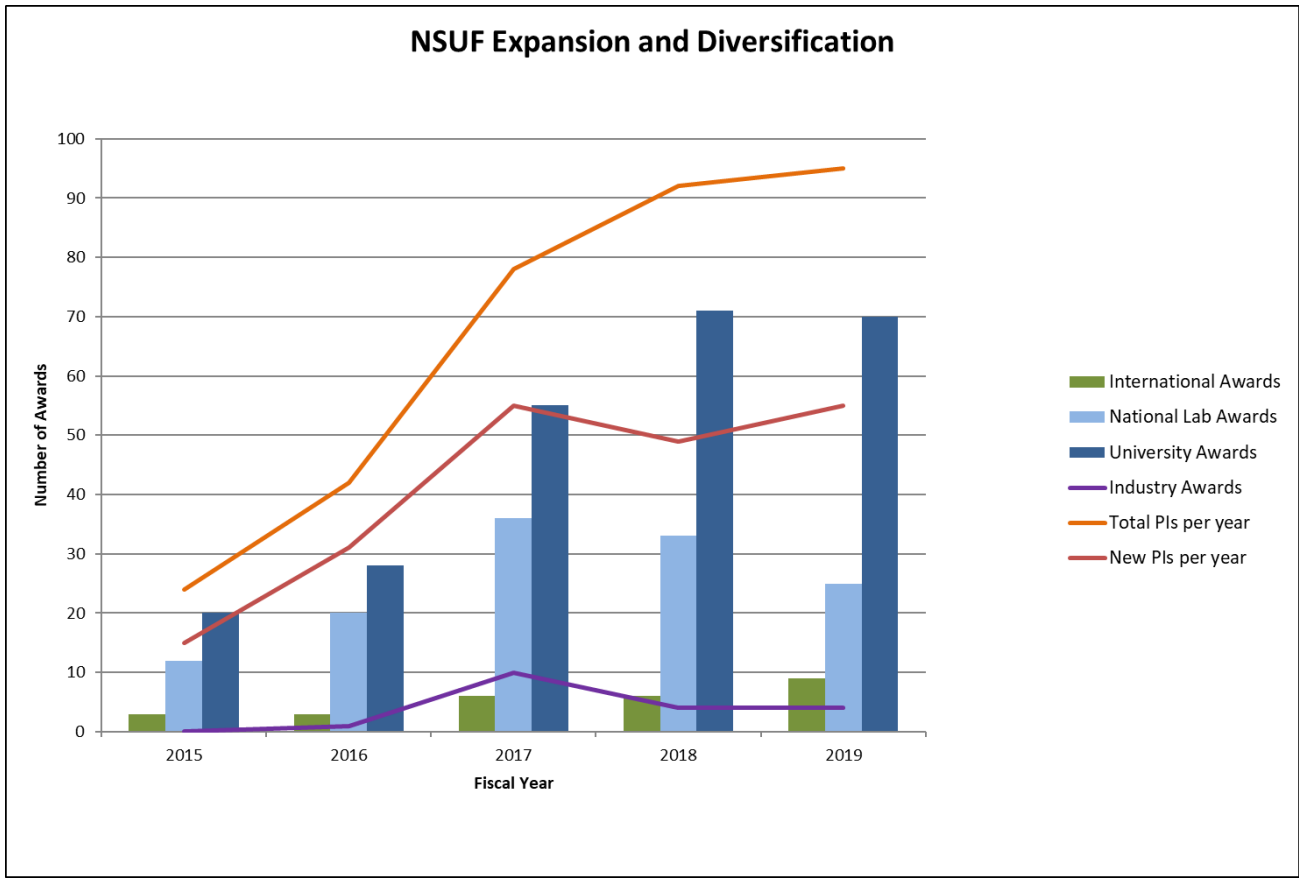

Figure 7. NSUF expansion and diversification.

Table 9. NSUF expansion and diversification.

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
International Awards	3	3	6	6	9
National Lab Awards	12	20	36	33	25
University Awards	20	28	55	71	70
Industry Awards	0	1	10	4	4
	FY 2015	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**
Total PIs Per Year	24	42	78	92	95
New PIs Per Year	15	31	55	49	55
Male/Female PIs	16/8	32/10	65/13	77/15	74/21
Minority-Serving Institutions (MSI)	6	4	0	10	2

NSUF Expand and Diversify User Community Analysis and Conclusions

In FY 2019, the NSUF continued its expansion and diversification. The number of projects awarded internationally increased from six in FY 2018 to nine in FY 2019. The number of awards to industry remained

constant at four awards, however it is notable that large industry CINR awards increased from one in FY 2018 to four in FY 2019

There was an increase in the number of new PIs from 49 in FY 2018 to 55 in FY 2019. Regarding diversification, there was a total of 95 NSUF PIs awarded in FY 2019. Seventy-four of these were male and 21 were female. This is a 40% increase in female NSUF PIs from FY 2018 to FY 2019. The 21 awarded female PIs represent 22% of the awards and compares quite favorably with the <20% female participation in the engineering workforce (according to available data in the 2019 Bureau of Labor Statistics Current Population Survey).

Summary:

- The NSUF continues to expand and diversify its user community.
- The NSUF maintained a high level of user interest from the universities.

Conclusions:

In FY 2019, the NSUF experienced a 34% decrease in the number of RTE proposals submitted and a slight increase of 4% in the number of CINR pre-applications submitted. The decrease in RTE proposals was achieved through an intentional effort by the NSUF to reduce the number of proposals submitted. FY 2018 saw a significant number of proposals (280), which taxed reviewer resources and jeopardized the quality of technical reviews. The decrease in the number of proposals received helped reduce the concerns with reviewer resources.

Even with the decrease in proposals submitted, the NSUF experienced a growth in the number of new PIs from FY 2018 to FY 2019. This is likely due to the increased submittals of RTE proposals and CINR pre-applications from graduate students, a trend that is strongly encouraged by university professors. The NSUF awarded projects to a higher percentage of female PIs than is generally observed in the engineering workforce, representing a very positive aspect of the NSUF's diversity efforts.

End Section VI. NSUF Expand and Diversify User Community

PROGRAM PERFORMANCE CONCLUSION:

In conclusion, the NSUF exceeded the performance goals for five of the six metrics.

Significant finding from the reported data include:

- The NSUF awarded a total of over $21M in new awards between RTE and CINR projects that represents an all-time high in new award funding for the NSUF and is a clear indication of the NSUF's drive to provide as many resources as possible to the nuclear energy research community.
- The increase in peer-reviewed journal publications from 70 in FY 2018 to 95 in FY 2019 clearly indicates that the NSUF is producing quality scientific output.
- Industry interest in the NSUF varies from year to year and might be shifting to larger CINR type projects.
- The NSUF is achieving good results in its efforts to increase diversity.

The metrics reported here were first established in FY 2014 and have provided important data for managing the NSUF program as well as setting goals and directions that enhance the national organization. Taken together, the interplay and interdependence between available budget, number and quality of proposals received, expansion and diversification of capabilities and user community, quality and impact of the research performed, and the prominence and positive exposure of the NSUF and its users can be clearly seen through the analysis of these metrics. The NSUF will continue to analyze metrics that will help it improve its performance in fulfilling the mission of DOE-NE and addressing the challenges confronting the nuclear research community.

End PROGRAM PERFORMANCE CONCLUSION