STATE/UNIVERSITY: FY 2017 NEUP/IUP/NEET/NSUF FUNDING AMOUNTS

Below is a state-by-state breakdown of projects that will receive funding through the Department of Energy's Nuclear Energy University Program (NEUP), Integrated University Program (IUP), Nuclear Science User Facilities (NSUF), and Nuclear Energy Enabling Technologies (NEET) programs.

ALABAMA – $7,500

Auburn University - $7,500

- **1 IUP Scholarships - $7,500**

Previous NEUP/IUP Funding: 5 Scholarships ($37,500) – Awarded in 2015 & 2016. FY 2009 – 2016 total: $37,500

Previous NEET Funding: None.

CALIFORNIA – $3,946,289

California State University, East Bay - $785,714

- **1 NEUP R&D Project - $785,714.** Mineral impurities are common in bentonite and clay buffer materials, proposed for many nuclear waste disposal options. Researchers will investigate the effects of calcite impurities on uranium(VI) sorption onto montmorillonite before and after mineral exposure to heat. Based on experimental sorption data and EXAFS analysis we will develop a new surface complexation model to determine under which conditions impurity effects are relevant, and how they can be incorporated in performance assessment models.

Previous NEUP/IUP Funding: None.

Previous NEET Funding: None.

Electric Power Research Institute – ($817,000 in NSUF Access)

- **1 NSUF Access Only Project – *($817,000 for NSUF facilities access only).*** Researchers will study why Zircaloy-2 material shows high hydrogen pickup and variability in BWR environments by investigating the correlation between the irradiated Zircaloy-2 oxide layer resistivity and hydrogen pickup. The scope of work will include in-situ electrochemical impedance spectroscopy (EIS) measurements on pre-irradiated channel and water rod samples as well as post-irradiation characterization of the same materials using Transmission Electron Microscopy and Scanning Electron Microscopy at Pacific Northwest National Laboratory (PNNL).

Previous NEET Funding: 2 NEET R&D Projects ($1,791,342) – Awards made in 2012 & 2015
FY 2009 – FY 2016 Total: 1,791,341

General Atomics - $450,575

- **1 NEET R&D Project with NSUF Access - $450,575 (+$985,000 in NSUF access).** Researchers will investigate the effects of temperature and thermal gradients on the irradiation performance and stability of joints in silicon carbide (SiC) cladding and endplug geometries. The project will fill a gap in understanding the performance SiC joint performance which will advance the development of accident tolerant fuels.

Previous NEET Funding: None.

University of California, Berkeley - $1,910,000

- **2 NEUP R&D Projects - $1,600,000.**
    1. **($800,000).** Researchers will develop a methodology for the design of molten salt reactor (MSR) Separate Effect Test and Integral Effect Test experiments. This methodology will identify and quantify sources of scaling distortion including radiative heat transport. The project would improve code performance and assist FHR/MSR vendors who are making licensing applications based on code results.
    2. **($800,000).** Researchers will develop better modeling methods, detectors, and facility design approaches to enable detection of inadvertent and deliberate hold up of fissile material in reprocessing and other nuclear material bulk handling facilities. The team will integrate results from this research project into a design methodology for future facilities to ensure accurate and reliable process monitoring for sustainable operation.
- **2 IUP Fellowships - $310,000**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($1,019,579); 16 R&D Project ($9,407,256); 15 Fellowships ($2,185,000); 1 Scholarship ($5,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016
FY 2009 – FY 2016 total: $12,616,835

Previous NEET Funding: None.

University of California, Irvine - $800,000

- **1 NEUP R&D Project - $800,000.** This project will investigate the alpha and gamma radiolysis-induced chemical degradation of ligands used for the removal of minor actinides from used nuclear fuel in advanced extraction systems such as ALSEP. Researchers will emphasize organic phase degradation, particularly complex solvents with multiple ligands as well as metal loaded solvents. The project will improve predictive capabilities of extraction processes by elucidating degradation pathways.

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($491,616); 3 R&D Projects ($2,599,938) - Awards made in FY 2009, 2010 2011, 2013 & 2014.
FY 2009 – FY 2016 total: $3,091,554

Previous NEET Funding: None.

COLORADO – $800,000

Colorado School of Mines - $800,000

- **1 NEUP R&D Project - $800,000.** Researchers will improve the production of ferritic/martensitic steels to suppress void swelling, embrittlement and improve low temperature ductility loss through reduction of 'free' nitrogen in the alloy. The process will simultaneously create a fine precipitate dispersion that refines the microstructure and increases microstructural stability with temperature and irradiation exposure.

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($744,062); 1 IRP ($3,000,000); 3 Minor Reactor Upgrades ($329,655); 8 R&D Projects ($5,748,940); 5 Fellowships ($765,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $10,587,657

Previous NEET Funding: 1 NEET R&D ($499,928) – Awarded in 2016
FY 2012 – FY 2016 total: $499,928

FLORIDA – $1,769,644

Florida International University - $7,500

- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 1 R&D Project ($800,000) – Award made in 2016
FY 2009 – FY 2016 total: $800,000

Previous NEET Funding: None.

University of Central Florida - $800,000

- **1 NEUP R&D Project - $800,000.** Researchers will measure the diffusivities of non-radioactive isotopes of Kr, I, Cs, Sr, Ru and Ag in graphite and uncover the mechanisms of transport at temperatures between 600 – 1800 C using microstructural examinations and large scale computer simulations. By using a suite of experimental techniques and multiscale simulations, pertinent transport/retention mechanisms of fission products in the selected graphite grades will become evident.

Previous NEUP/IUP Funding: None.

Previous NEET Funding: None.

University of Florida – $962,144

- ***1 NEUP General Scientific Infrastructure - $246,379.*** Fill the nationally wide need gap for IASCC test facility in order to support the materials degradation and advanced nuclear materials development for the LWR Sustainability (LWRS) program. Support the on-going, under-review and near future nuclear materials research at the University of Florida. Train the next generation of work force for nuclear engineering R&D sector with radioactive materials hands-on experience
- **1 NEUP R&D Project - $398,265.** Researchers will perform reactor physics benchmark evaluations of Power Burst Facility experiments regarding differential reactivity worth of the control and transient rods, shim rod worth, in-pile-tube reactivity worth, shutdown reactivity, fuel assembly reactivity worth, core void coefficients of reactivity, in-pile-tube void coefficient, and coolant temperature coefficient of reactivity. The results will be incorporated in the International Reactor Physics Experiment Evaluation Project (IRPhEP).
- **2 IUP Fellowships - $310,000**
- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($462,288); 3 Reactor Upgrades ($960,589); 8 R&D Projects ($5,635,230); 6 Fellowships ($925,000); 12 Scholarships ($65,000) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015 & 2016.

FY 2009 – FY 2016 total: $*$8,048,107*

Previous NEET Funding: 1 NEET R&D Award ($489,135).

FY 2012 – FY 2016 total: $489,135

GEORGIA – $192,500

Georgia Institute of Technology - $170,000

- **1 IUP Fellowship - $155,000**
- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($978,000); 2 IRPs ($10,999,773); 10 R&D Projects ($7,488,719); 13 Fellowships ($2,000,000); 10 Scholarships ($55,000) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015 & 2016.

FY 2009 – FY 2016 total: $21,521,492

Previous NEET Funding: 2 NEET R&D projects ($800,000) – Awards made in 2013.
FY 2012 – FY 2016 total: $800,000

Kennesaw State University - $22,500

- **3 IUP Scholarships - $22,500**

Previous NEUP/IUP Funding: 2 Scholarships ($15,000) – Awards made in 2016
FY 2009 – FY 2016 total: $15,000

Previous NEET Funding: None.

IDAHO – $2,970,682

Boise State University - $1,847,892

- **1 NEET R&D Project - $890,000.** Researchers will develop a novel hybrid plasmonic sensor that is easier and less costly to manufacture, and which will continue to function properly after radiation exposure. Reusability is a significant feature that will further reduce cost; after reaching critical temperatures, the facility could quickly and easily reset and reuse the sensor for subsequent measurements.
- **1 NEET R&D Project with NSUF Access - $500,000 (+$535,943 in NSUF Access).** Researchers will develop and demonstrate an additive manufacturing approach to fabricate nonintrusive and spatially resolved sensors for in-pile thermal conductivity measurement. The team will print thermal conductivity sensors onto fuel components using an aerosol jet printing approach, and study in-pile performance of the printed sensors through irradiation and post-irradiation testing. This research has the potential to establish a new sensor-manufacturing paradigm for the nuclear industry.
- **1 NEUP General Scientific Infrastructure - $295,392.** Synthesis and characterization equipment (advanced manufacturing) to support advanced manufacturing for nuclear sensors. This builds upon an infrastructure grant from FY2016.
- **1 IUP Fellowship - $155,000**
- **1 IUP Scholarship - $7,500**

Previous NEUP Funding: 3 General Scientific Infrastructure ($660,000); 1 R&D Project ($785,396); 2 Scholarships ($10,000); 2 Fellowships ($310,000) – Awards made in 2009, 2010, 2015 & 2016.
FY 2009 – FY 2016 total: $1,765,396

Previous NEET Funding: 1 NEET R&D Project ($980,804); 1 NEET-NSUF R&D Project ($500,000) – Awards made in 2014 & 2016.
FY 2012 – FY 2016 total: $1,480,804

Idaho National Laboratory – ($733,242 in NSUF Access)

- **1 NSUF Access Only Project – *($733,242 for NSUF facilities access only).*** Researchers will grow the available database of post irradiation data available for annular mixed-

oxide (MOX) fuel irradiated in fast spectrum reactors by examining irradiated fuel from the FO-2 irradiation. The data collected in this project would be used to validate models currently being developed at the Japanese Atomic Energy Agency (JAEA) for fuel performance models that seek to simulate MOX fuel behavior and will be implemented in BISON.

Previous NEET Funding: 3 NEET Infrastructure Awards ($1,666,893); 4 NEET R&D Awards ($3,600,000) – Awards made in 2012, 2013, 2014 & 2015
FY 2012 – FY 2016 total: $5,266,893

University of Idaho - $1,122,790

- **1 NEUP General Scientific Infrastructure - $303,549.** Installation of a thermal hydraulic test loop: printed circuit heat exchangers (PCHEs), test steels and Ni-based alloys in simulated water reactor environments. Dynamic materials testing loop: An existing static autoclave testing system will be modified with a high pressure re-circulation flow loop, loading train, and required instrumentation for fatigue crack growth and stress corrosion cracking of structural materials used in nuclear reactors. Thermal analysis system: adsorption isotherms for various systems including non-radioactive isotopes of
- fission products on graphite and graphitic materials.
- **1 NEUP R&D Project – $796,741.** This project will evaluate the electrochemical speciation behavior of iodide, and telluride in LiCl-KCl eutectic, LiCl, and LiCl + Li2O electrolytes at temperatures relevant to reprocessing conditions. By using rhenium as surrogate for technetium, the electrochemical, and chemical speciation properties of rhenium ions will be investigated in chloride molten salts with the addition of molybdenum and ruthenium.
- **3 IUP Scholarships - $22,500**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($427,000); 14 R&D Projects ($8,940,609); 1 Fellowship ($155,000); 6 Scholarships ($30,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2015.
FY 2009 – FY 2016 total: $9,552,609

Previous NEET Funding: None.

ILLINOIS – $2,210,668

Illinois Institute of Technology - $160,000

- ***1 NEUP General Scientific Infrastructure - $160,000.*** The proposed equipment (autoclave with two sapphire windows) will allow in-situ micro-scale characterization of oxide microstructure of nuclear materials under corrosion in various environments as well as the in-situ investigation of primary water radiolysis effect on corrosion.

- **Previous NEUP/IUP Funding:** 2 General Scientific Infrastructure ($547,280); 2 Fellowships ($310,000); 1 Scholarship ($5,000) – Awards made in 2010, 2012, 2015 & 2016.
- FY 2009 – FY 2016 total: $862,280

- **Previous NEET Funding:** None.

University of Illinois, Urbana-Champaign - $2,050,668

- **1 NEUP General Scientific Infrastructure - $280,670.** Autoclave Recirculating Loop to Enable LWR Immersion, Slow Strain Rate (SSRT), and Constant Extension Rate Testing (CERT) to perform experiments related to stress corrosion cracking, cyclical fatigue, and creep of LWR advanced alloy structural components.
- **2 NEUP R&D Projects - $1,599,998**
  1. **($800,000)** Researchers will use advanced microanalytical analysis techniques to study SCC and IASCC of stainless steel and Ni-Cr alloy weldments. CERT, autoclave immersion, and ion irradiation will be used to determine synergistic effect of LWR environmental factors. Results from the experimental component of the proposed work scope will be used for enhanced predictive capability of the INL Grizzly code via XFEM.
  2. **($799,998)** Researchers will develop a systematic Enterprise Risk Management framework, which utilizes Decision Tree (DT) logic to consider high-level production-loss scenarios, and their underlying physical and social causes throughout the lifecycle. In the proposed DT, uncertainty nodes will be quantified by plant-specific risk analysis using the Risk-Informed Safety Margin Characterization (RISMC) Toolkit, and cost-benefit analysis will be conducted for end states reflecting consequences of managerial decision-making.
- **1 NSUF Access Only – (*$203,096 for NSUF facilities access only).*** Researchers will quantitatively measure sub-5nm defect structures, particularly tiny vacancy clusters, which are inaccessible using any other microstructural analysis techniques. The project will use North Carolina State University's PALS and DBS systems to study nano-scale defect structures in ATR neutron irradiated ferritic and ferritic/martenistic alloys.
- **1 IUP Fellowship - $155,000**
- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($615,358); 1 IRP ($3,499,945); 6 R&D Projects ($5,311,354); 4 Fellowships ($615,000); 28 Scholarships ($157,500) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.

FY 2009 – FY 2016 total: $10,199,157

Previous NEET Funding: None.

INDIANA – $815,000

Purdue University - $815,000

- **1 NEUP R&D Project - $800,000.** Researchers will develop a first-of-a-kind physics-based defense-in-depth strategy to defend against false data injection attacks which attempt to change the information used by the I/C network to set reactor state. The approach employs a new design philosophy to check for information trustworthiness/integrity in order to determine whether the information is genuinely generated during the actual operation of the nuclear unit under either normal or off-normal conditions.
- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 1 General Scientific Infrastructure ($300,000); 1 Major Reactor Upgrade ($1,276,812); 10 R&D Projects ($6,961,100); 3 Fellowships ($455,000); 6 Scholarships ($30,000) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015, & 2016.
FY 2009 – FY 2016 total: $9,022,912

Previous NEET Funding: 2 NEET R&D projects ($1,592,572) – Awards made in 2012 & 2014.

FY 2012 – FY 2016 total: $1,592,572

KANSAS – $977,500

Kansas State University - $977,500

- **1 NEUP R&D Project – $800,000.** Researchers will investigate the role of raw water on degraded heat transfer and fluid flow in the reactor core and debris bed. X-ray imaging techniques, optical-fiber high speed temperature sensing systems and radioactive tracer salts will be used to simultaneously measure experimental data on void fraction, temperature and salt deposition rate. This data will be used to obtain correlations for heat transfer and fluid flow in case of raw water injection.
- **1 IUP Fellowship – $155,000**
- **3 IUP Scholarships – $22,500**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($435,690); 4 Reactor Upgrades ($1,839,831); 2 R&D Project ($1,598,518); 4 Scholarships ($22,500) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015 & 2016.

FY 2009 – FY 2016 total: $3,896,539

Previous NEET Funding: None.

MARYLAND – $315,120

University of Maryland - $315,120

- **1 NEUP Reactor Upgrade - $315,120.** University of Maryland will purchase a spare control rod drive mechanism, end fittings for the new fuel elements and upgrade the software for the facility's gamma spectrometry equipment.

Previous NEUP/IUP Funding: 1 General Scientific Infrastructure ($165,000); 4 R&D Projects ($2,199,966); 1 Fellowship ($155,000); 1 Scholarship ($7,500) – Awards made in 2009, 2011, 2013, 2015 & 2016.

FY 2009 – FY 2016 total: $2,527,466

Previous NEET Funding: None.

MASSACHUSETTS – $1,588,730

Massachusetts Institute of Technology - $1,188,730

- **1 NEUP General Scientific Infrastructure - $218,825.** New cameras (VIS and IR camera (2)) to expand experimental capabilities in two phase flow and boiling heat transfer, leveraging high-speed infrared and video imaging techniques, spatial resolution of 100 μm and a temporal resolution of 0.4 ms.
- **1 NEUP R&D Project - $799,905.** Researchers will characterize the thermal-hydraulics behavior of accident tolerant fuel (ATF) materials by measuring critical heat flux (CHF) under normal and off-normal light water reactor conditions, and Leidenfrost temperature in post-loss-of-coolant accident (LOCA) conditions. This work will yield material-specific models and/or correlations that can be readily implemented in state-of-the-art simulation tools.
- **1 IUP Fellowship – $155,000**
- **2 IUP Scholarships – $15,000**

Previous NEUP/IUP Funding: 3 General Scientific Infrastructure ($609,758); 5 Reactor Upgrades ($1,875,526); 3 IRPs ($15,500,000); 9 R&D projects ($5,740,112); 15 Fellowships ($2,300,000); 7 Scholarship ($50,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.

FY 2009 – FY 2016 total: $26,075,396

Previous NEET Funding: None.

University of Massachusetts, Lowell - $400,000

- **1 NEUP R&D Project - $400,000.** Researchers will combine fluoride-salt-cooled, high temperature reactors (FHR) with advanced gas reactor (AGR) refueling technology to address several significant challenges that remain in the development of FHR technology. The project will adapt AGR refueling technology by using the new fuel-inside-radial-moderator fuel form, which will also introduce new ways of dealing with decay heat.

Previous NEUP/IUP Funding: 3 Reactor Upgrades ($1,130,230); 2 R&D Project (1,426,176); 1 Fellowship ($50,000); 4 Scholarships ($25,000) - Awards made in 2009, 2010, 2011, 2015 & 2016.
FY 2009 – FY 2016 total: $2,631,406

Previous NEET Funding: None.

MICHIGAN – $1,417,500

University of Michigan - $1,417,500

- **1 NEUP General Scientific Infrastructure - $300,000.** Advanced high-speed X-ray imaging, high resolution distributed temperature sensors, and high resolution profile velocimetry sensing for application in liquid metals and other fluids + development, design, and testing of new fast neutron imaging technologies.
- **1 NEUP R&D Project - $800,000.** Researchers will examine the effects of coolant leakage and air ingress through three different investigations. The overall objective of this work is to characterize near and far field behavior of Helium/Air mixing in containment, and to determine rates and amounts of air leaked back into the reactor after a depressurization event.
- **2 IUP Fellowships - $310,000**
- **1 IUP Scholarship - $7,500**

Previous NEUP Funding: 4 General Scientific Infrastructure ($989,277); 1 IRP ($5,000,000); 18 R&D projects ($13,736,832); 18 Fellowships ($2,765,000); 30 Scholarships ($150,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $22,641,109

Previous NEET Funding: 2 NEET R&D Awards ($999,611) – Awards made in 2016
FY 2012 – FY 2016 total: $999,611

MISSOURI – $2,073,363

Missouri University of Science and Technology - $954,317

- **1 NEUP R&D Project - $799,317.** Researchers will design, build, test and install a submersible tomography platform for performing pool-side physical, structural, and chemical characterization of irradiated fuel elements for test reactors.
- **1 IUP Fellowship - $155,000**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($600,000); 2 Reactor Upgrades ($400,000); 3 R&D Projects ($1,972,149); 9 Scholarships ($47,500) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, & 2015.
FY 2009 – FY 2016 total: $3,019,649

Previous NEET Funding: None.

University of Missouri, Columbia - $1,119,066

- ***1 NEUP Reactor Upgrade - $319,067.*** University of Missouri, Columbia will purchase new paperless strip chart recorders and an off-gas (stack) effluent monitoring system to replace obsolete safety instrumentation.
- ***1 NEUP R&D Project - $799,999.*** Researchers will use a variety of experimental techniques to acquire data for fission product diffusion, transport and adsorption of fission products in various graphites, relating to nuclear reactors at high temperatures. Measurements will be taken using non-irradiated graphite using fission product surrogates.

Previous NEUP/IUP Funding: 1 General Scientific Infrastructure ($251,845); 5 Reactor Upgrades ($2,061,583); 7 R&D Projects ($4,542,167); 1 Fellowship ($150,000); 2 Scholarship ($15,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2015 & 2016.
FY 2009 – FY 2016 total: $7,020,595

Previous NEET Funding: None.

NEVADA – $415,000

University of Nevada, Las Vegas – $7,500

- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 1 General Scientific Infrastructure ($294,222); 10 R&D Projects ($6,101,126); 4 Fellowships ($615,000) – Awards made in 2009, 2010, 2011, 2012, 2014 & 2015
FY 2009 – FY 2016 total: $7,010,348

Previous NEET Funding: None.

University of Nevada, Reno - $407,500

- **1 NEUP R&D Project - $400,000.** Researchers will develop physics-based computational tools to predict used nuclear fuel cladding temperatures within, and water vapor removal rates from, canisters during existing and proposed drying processes. The project will explore a range of gas pressures (including rarefication), and steady and unsteady external gas flows rates. The tools will be used to develop drying processes that minimize drying time while maintaining cladding temperatures.
- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($1,025,651); 4 R&D projects ($2,159,852); 1 Scholarship ($7,500) – Awards made in 2009, 2010, 2011, 2012, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $3,193,003

Previous NEET Funding: None.

NEW HAMPSHIRE – $800,000

University of New Hampshire - $800,000

- **1 NEUP R&D Project - $800,000.** Researchers will expand the capabilities of BISON and MOOSE to simulate the structural dynamic response of fuel rods and fuel assemblies during handling (wet and dry storage) and transportation. Expanding the capabilities of BISON and MOOSE to facilitate the evaluation of the dynamic response of fuel rods and assemblies is important to conduct a more reliable risk assessment of fuel assemblies, as well as storage and transportation casks.

Previous NEUP/IUP Funding: None.

Previous NEET Funding: None

NEW JERSEY – $7,500

Thomas Edison State University - $7,500

- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 1 Scholarship ($5,000) – Award made in 2014
FY 2009 – FY 2016 total: $5,000

Previous NEET Funding: None.

NEW MEXICO – $2,915,000

Los Alamos National Laboratory - $500,000

- **1 NEET R&D Project with NSUF Access - $500,000 (+58,968 in NSUF Access).** Researchers will join cladding tubes of 14YWT alloy and a ferritic ODS alloy using capacitor-discharge resistance welding (CDRW), a rapid, solid-state welding (SSW) process with very low heat input. The CDRW process is especially well suited for cladding applications. The project will provide a significant advance in the state of the knowledge for joining of 14YWT and ferritic ODS materials, and will permit their broader use with increased confidence.

Previous NEET Funding: 2 NEET R&D projects ($1,880,000) – Awards made in 2012 & 2013
FY 2012 – FY 2016 total: $1,880,000

University of New Mexico – $2,415,000

- **3 NEUP R&D Projects - $2,400,000.**
  1. **($800,000).** Researchers will develop extreme performance bulk nanocomposite Zirconium/Niobium and Copper/Niobium alloys with varying layer thickness that can withstand irradiation doses up to 600 dpa at elevated temperatures (up to 700°C) using innovative accumulative roll bonding techniques. Ion irradiations are proposed to test the performance of the alloys at elevated temperatures
  2. **($800,000).** Researchers will develop a holistic best estimate assessment of the potential impact of different ATF cladding materials with regards to heat transfer characteristics, the boiling curve, critical heat flux, fuel mass/volume/specific power density, and neutronics effects due to changes in the lattice design or parasitic neutron absorption during design basis accident conditions in light water reactors
  3. **($800,000).** Researchers will develop a new bimetallic alloy (Incoloy 800H/Ni-201) structural material for the MSR, and compare its post-exposure mechanical performance in flowing FLiBe with single alloys SS 316, Hastelloy N, and Incoloy 800H, in the context of ASME codification
- **2 IUP Scholarships – $15,000**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($343,797); 2 Reactor Upgrades ($100,000); 4 R&D Projects ($2,441,879); 4 Fellowships ($620,000); 3 Scholarships ($17,500) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $3,523,176

Previous NEET Funding:

NEW YORK – $1,342,425

Alfred University - $379,925

- ***1 General Scientific Infrastructure - $379,925.*** CeraFab 8500 printer will enable additive manufacturing work on ceramic materials by developing techniques and training faculty and graduate students through work on fuel surrogates.

Previous NEUP/IUP Funding: 1 General Scientific Infrastructure ($262,141); R&D ($1,720,000); 1 Fellowship – Awards made in 212, 2013 & 2014.
FY 2009 – FY 2016 total: $2,137,141

Previous NEET Funding: None.

Excelsior College - $7,500

- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: None.

Previous NEET Funding: None.

Rensselaer Polytechnic Institute – $955,000

- **1 NEUP R&D Project ($800,000).** Researchers will provide end users an ability to run both MCNP6 and PROTEUS codes from a common user input in Workbench by (1) templating user-provided engineering scale specifications to code-specific input requirements, (2) enabling multi-fidelity analysis of a system from a common input using MCNP6 and PROTEUS and (3) allowing the easy use of high-fidelity simulations to inform lower-order models for the design, analysis, and licensing of advanced nuclear systems and experiments.
- **1 IUP Fellowship - $155,000**

Previous NEUP/IUP Funding: 3 General Scientific Infrastructure ($634,011); 2 Reactor Upgrades ($350,000); 6 R&D Projects ($4,156,199); 4 Fellowships ($615,000); 7 Scholarships ($37,500) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $5,792,710

Previous NEET Funding: None.

NORTH CAROLINA – $1,783,155

AREVA – ($630,000 in NSUF Access)

- **1 NSUF Access Only Project – *($630,000 for NSUF facilities access only).*** To provide irradiation and post-irradiation examination program for four neutron absorber materials.

The team will evaluate four pellets of each absorber type irradiated to target doses of 1.3 and 2.7 x 1022 n/cm2. Following neutron irradiation, examinations will focus on pellet integrity using optical microscopy and dimensional measurements to characterize irradiation induced swelling. This scope of work will utilize HFIR and hot cells at ORNL.

Previous NEET Funding: None.

Electric Power Research Institute - ($3,588,402 in NSUF Access)

- **1 NSUF Access Only Project – *($3,588,402 for NSUF facilities access only).*** Researchers will provide experimental data on fuel fragmentation's role in fuel burnup to make the case for increasing the regulatory burnup limit past 62 Gwd/MTU. The scope of work involves re-irradiation of high burnup fuel at the appropriate power levels in ATR followed by transient testing, both out of reactor and in TREAT.

Previous NEET Funding: 2 NEET R&D Projects ($1,799,456) – Awards made in 2012 & 2016.
FY 2012 – FY 2016 total: $1,799,456

North Carolina State University - $1,783,155

- **1 NEUP General Scientific Infrastructure - $288,467.** A full system for stress-corrosion cracking testing in light water reactor environments; two individual "basic" high pressure autoclaves essentially for teaching purposes; and electrochemical corrosion testing equipment.
- **1 NEUP NEET Project - $999,688.** Researchers will develop high temperature embedded/integrated sensors for wireless monitoring of reactor and fuel cycle systems. Existing sensing techniques for NPP structures are mostly challenged by the limitations at high temperatures, by the lack of radiation resistance, by the poor embed-ability because of the wired electric power supply and communication, and by unknown long-term performance under harsh environments.
- **3 IUP Fellowships - $465,000**
- **4 IUP Scholarships - $30,000**

Previous NEUP/IUP Funding: 3 General Scientific Infrastructure ($925,000); 1 Integrated Research Project ($4,000,000); 4 Reactor Upgrades ($2,182,827); 21 R&D Projects ($15,385,377); 9 Fellowships ($1,390,000); 35 Scholarships ($207,500) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $24,090,704

Previous NEET Funding: 1 NEET R&D project ($788,156) – Awarded in 2012.
FY 2012 – FY 2016 total: $788,156

OHIO – $1,551,758

The Ohio State University - $1,551,758

- **1 General Scientific Infrastructure - $249,945.** Will support research in advanced sensor development and material property characterization. Instruments include photoluminescence and UV-Vis spectrometers, GHz oscilloscope, spectrum analyzer, pulsed laser, fiber optic sensor characterization equipment, inert environment glovebox, equipment for ultrasonics testing, and mechanical translation stages.
- **1 NEUP R&D Project - $799,985.** Researchers will develop a computationally feasible and user friendly process to augment the traditional probabilistic risk assessment (PRA) results with improved representation of epistemic uncertainties and process/hardware/software/human interactions at plant level applications.
- **1 NEUP Reactor Upgrade - $184,328.** Ohio State University will acquire radiation shielding material and instrumentation to recommission two neutron beam ports at the research reactor.
- **2 IUP Fellowships - $310,000**
- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 3 General Scientific Infrastructure ($698,815); 4 Reactor Upgrades ($730,000); 19 R&D projects ($13,462,279); 11 Fellowships ($1,685,000); 20 Scholarships ($105,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $16,681,094

Previous NEET Funding: 1 NEET R&D project ($399,990) – Awarded in 2013.
FY 2012 – FY 2016 total: $399,990

OKLAHOMA – $786,648

University of Oklahoma - $786,648

- **1 NEUP R&D Project - $786,648.** Researchers will implement and validate state-of-the-art turbulence modeling techniques in Nek5000 to improve predition of liquid metal flows. Specific methods to be investigated include: variable PrT and algebraic heat flux models (AHFM) for URANS simulation; partially-averaged Navier-Stokes (PANS) and dynamic hybrid RANS-LES (DHRL) for hybrid RANS-LES simulation; and variable PrT subgrid heat flux modeling for LES.

Previous NEUP/IUP Funding: None.

Previous NEET Funding: None.

OREGON – $1,110,000

Oregon State University - $1,110,000

- **1 NEUP R&D project - $800,000.** Researchers will enhance MARMOT to predict mechanical and corrosion properties of dual-phase stainless steels as a function of composition, aging time and temperature by using combined experimental data and lower length scale models.
- **2 IUP Fellowships - $310,000**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($852,171); 4 Reactor Upgrades ($2,376,380); 1 IRP ($4,000,000); 13 R&D Projects ($10,038,514); 6 Fellowships ($920,000); 8 Scholarships ($40,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $18,227,065

Previous NEET Funding: None.

PENNSYLVANIA – $5,099,000

Pennsylvania State University - $4,599,000

- **1 NEUP Integrated Research Project - $3,000,000.** Researchers will develop a macroscale modeling capability that can assess the impact of hydride behavior on cladding integrity in commercial spent nuclear fuel during pool storage, drying, transportation, and long-term dry cask storage. To develop this capability, the team will investigate both experimentally and with computational modeling the hydride behavior relative to three critical phenomena in various zirconium alloy cladding materials: 1) Migration and redistribution of hydrogen; 2) Precipitation and dissolution of hydride particles; 3) The impact of hydride microstructure on mechanical properties of the cladding.
- **1 NEUP Reactor Upgrade - $1,084,000.** Pennsylvania State University will replace the existing control console with a system based on nuclear-grade hardware, including eventually a digital safety system. The software and system architecture would be "open source" with all technical and regulatory content would be shared among the TRIGA Reactor User's Group.
- **1 NEUP R&D Project - $500,000.** Researchers will add the capability to model irradiation assisted grain growth to the MARMOT tool by using in-situ ion irradiation of UO2 to quantify the effect of irradiation on grain growth. The team will investigate the hypothesis that irradiation assisted grain growth is caused by thermal spikes resulting from atom collisions. The model added to MARMOT will couple the existing grain growth model to a heat conduction simulation using a stochastic heat source describing the thermal spike.
- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($549,980); 1 Reactor Upgrade ($1,362,253); 1 IRP ($3,000,000); 11 R&D Projects ($8,771,758); 4 Fellowships ($615,000); 13 Scholarships ($70,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $14,368,991.

Previous NEET Funding: None.

University of Pittsburgh - $500,000

- ***NEET R&D Project with NSUF Access - $500,000 (+$775,090 in NSUF Access).*** Researchers will establish the foundation for converging disciplines of multi-functional fiber optic sensors and additive manufacturing for smart part fabrications for nuclear energy applications, especially for in-pile applications. Using advanced laser fabrication techniques, the team will develop both high-temperature stable point sensors and distributed fiber sensors for high spatial resolution measurements in radiation-hardened silica and sapphire fibers.

Previous NEUP Funding: 1 General Scientific Infrastructure ($300,000); 2 R&D Projects ($1,676,422); 5 Fellowships ($770,000); 11 Scholarships ($70,000) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $2,816,422

Previous NEET Funding: 1 NEET R&D project ($987,676) – Awarded in 2014.
FY 2012 – FY 2016 total: $987,676

Westinghouse Electric Company LLC – ($830,452 in NSUF Access)

- **1 NSUF Access Only Project – ($830,452 *for NSUF facilities access only).*** Researchers will collect post irradiation examination data for additive manufactured zironium-2 materials for LWR fuel applications. The scope of work includes PIE of a previously irradiated zirconium material that was fabricated using laser powder bed fusion. The sample was irradiated at MIT's reactor and PIE will be conducted at Westinghouse's Churchill hotcell facility.

Previous NEET Funding: 1 NEET R&D Project ($789,228) – Award made in 2016
FY 2012 – FY 2016 total: $789,228

SOUTH CAROLINA - $2,649,600

Clemson University - $1,049,600

- **1 NEUP General Scientific Infrastructure - $249,600.** Raman microscope with high-temperature atmosphere-controlled capability for the characterization of ceramic materials relevant to diverse aspects of the nuclear fuel cycle.
- **1 NEUP R&D Project ($800,000).** Researchers will develop a ceramic membrane technology for tritium separation and recovery to support the nuclear fuel cycle. Low-

temperature water adsorption properties of nanoscale structured ceramics, combined with demonstrated hydrogen isotope exchange in their hydrated layers provide a low cost and unique avenue to address tritium management challenges

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($495,585); 7 R&D Projects ($5,485,458) –2 Scholarships ($15,000) – Awards made in 2010, 2011, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $5,996,043

Previous NEET Funding: None.

University of South Carolina - $1,600,000

- **2 NEUP R&D Projects - $1,600,000.**
    1. **($800,000)** Researchers will develop detection systems capable of neutron, gamma-ray, x-ray, and alpha monitoring in high-temperature and high radiation environments for extended periods of time. The detectors will be used to strengthen nuclear safeguards by enhancing nuclear material control and accounting in nuclear fuel reprocessing facilities.
    2. **($800,000)** Researchers will develop NDE sensors and probabilistic cable insulation diagnosis and prognosis algorithms (particle filtering), and modeling and experiments to monitor cable insulation health. Two different types of sensor will be deployed to detect insulation damage. The team will also develop cable insulation degradation modeling to further understand defects in cable insulation.

Previous NEUP/IUP Funding: 1 General Scientific Infrastructure ($200,500); 1 IRP ($4,000,000); 8 R&D Projects ($6,432,646); 2 Fellowships ($310,000); 3 Scholarships ($15,000) – Awards made in 2009, 2010, 2011, 2012, 2013 , 2016 & 2016.
FY 2009 – FY 2016 total: $10,958,146

Previous NEET Funding: None.

TENNESSEE - $2,597,500

Oak Ridge National Laboratory - $390,000

- **1 NEET R&D Project with NSUF Access - $390,000 (+$651,717 in NSUF Access).** Researchers will identify correlations between microstructures and mechanical properties of neutron-irradiated advanced ferritic-martensitic and austenitic steels through comprehensive experimental post-irradiation examinations, coupled with thermodynamics, kinetics and microstructural hardening modeling of selected samples that are relevant to Light Water Reactors. Results from other ongoing studies and literature data of similar alloys will be collected and compared to complement the correlations.

Previous NEET Funding: 1 General Scientific Infrastructure ($281,473); 8 NEET R&D projects ($6,789,000); 3 NEET-NSUF Projects ($595,330) – Awards made in 2012, 2013, 2014, 2015 & 2016.
FY 2012 – FY 2016 total: $7,665,803

University of Tennessee at Knoxville - $1,207,500

- **1 NEUP R&D Project - $800,000.** This project will study the thermodynamics of melt and quench phases of nuclear waste glasses and glass ceramics and link this information to the underlying short-range and medium-range structure. Advanced calorimetric techniques and neutron total scattering with pair distribution function analysis will be applied to obtain these data. Computer simulations will complement the experimental effort.
- **1 NSUF Access Only Project – *($300,000 in NSUF Facilities Access Only).*** Researchers will develop high-performance simulation tools to predict fission gas bubble evolution in nuclear fuel. The scope of work in this project includes access to 10 Million CPU hours of high performance computing (HPC) resources each year for 2 years
- **13 IUP Scholarships - $97,500**
- **2 IUP Fellowships - $310,000**

Previous NEUP/IUP Funding: 3 General Scientific Infrastructure ($734,917); 1 IRP ($3,510,000); 14 R&D projects ($10,419,063); 13 Fellowships ($1,905,000); 51 Scholarships ($317,500) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $16,886,480

Previous NEET Funding: 1 NEET R&D project ($1,000,000) – Award made in 2015.
FY 2012 – FY 2016 total: $1,000,000

Vanderbilt University - $1,000,000

- **1 NEET R&D Project - $1,000,000.** Researchers will develop a novel and generalizable 3-D sensor network and associated data analytics for the chemo-mechanical degradation state monitoring, diagnostics and prognostics of corrosive processes in representative secondary piping structures. This project will address current and future needs in nuclear power plants for cost-effectively maintaining the safety and operational performance of passive structural components.

Previous NEUP/IUP Funding: 3 R&D Projects ($2,394,132); 2 Fellowships ($310,000) – Awards made in 2013, 2014, & 2016.
FY 2009 – FY 2016 total: $2,704,132

Previous NEET Funding: None.

TEXAS - $5,070,842

Texas A&M University - $4,915,842

- **1 NEUP General Scientific Infrastructure - $235,985.** State-of-the-art X-ray tomography combined to high-frequency optical sensors to our advanced flow visualization systems to perform high resolution measurements of single- and multi-phase flows.
- **2 NEUP R&D Projects - $1,199,857**
    1. **($399,857)** Researchers will explore bulk removal of U, Np, Pu and Am, from used nuclear fuel by studying the mechanisms of removal. A co-crystallization of the hexavalent actinides with U(VI) has already been demonstrated and researchers plan to develop a process based around this approach. Removal of these elements would be advantageous for future nuclear fuel recycle.
    2. **($800,000)** Researchers will produce high-quality, high spatial and temporal resolution temperature and flow datasets for wire-wrapped rod bundle geometries. Different bundle sizes, configurations (including duct's and pin's deformation) and Low-Prandlt fluids will be investigated. A unique set of data will be produced to support advanced CFD tools validation, including Nek5000.
- **1 Integrated Research Project - $3,000,000 -** Researchers will contribute to the molten salt fast reactor concept while educating new workforce in molten salt systems. The project will focus in five technical areas: 1) Material and corrosion science; 2) Optical/chemical sensor development; 3) Modeling, multiphysics simulation, and uncertainty quantification; 4) Thermal hydraulic science; 5) 35cl(n,p) cross-section measurements.
- **3 IUP Fellowships - $465,000**
- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 3 General Scientific Infrastructure ($638,000); 3 Reactor Upgrades ($1,614,136); 1 IRP ($4,500,000); 19 R&D projects ($14,251,540); 14 Fellowships ($2,210,000); 10 Scholarships ($50,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $23,263,676

Previous NEET Funding: 1 NEET R&D project ($800,000) – Award made in 2015.
FY 2012 – FY 2016 total: $800,000

University of Texas at Austin - $155,000

- **1 UP Fellowship - $155,000**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($369,175); 3 Reactor Upgrades ($461,695); 3 R&D Projects ($1,490,072); 9 Fellowships ($1,230,000); 1 Scholarship ($5,000) – Awards made in 2009, 2010, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $3,555,942

Previous NEET Funding: None.

UTAH - $802,500

Brigham Young University - $15,000

- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 6 Scholarships ($45,000) – Awards made in 2015 & 2016.
FY 2009 – FY 2016 total: $45,000

Previous NEET Funding: None.

University of Utah - $177,500

- **1 IUP Fellowship - $155,000**
- **3 IUP Scholarships - $22,500**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($319,629); 3 Reactor Upgrades ($607,547); 5 R&D Projects ($3,882,513); 1 Fellowship ($155,000); 2 Scholarships ($10,000) – Awards made in 2010, 2011, 2012, 2013 & 2014.
FY 2009 – FY 2016 total: $4,974,689

Previous NEET Funding: None.

Utah State University - $610,000

- **1 NEUP General Scientific Infrastructure - $300,000.** Focused Ion Beam for Advanced Specimen Preparation, 3D Microstructural Characterization, and Simulated Irradiation.
- **2 IUP Fellowships - $310,000**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($942,399); 1 IRP ($5,000,000); 5 R&D projects ($3,323,252); 6 Fellowships ($925,000); 16 Scholarships ($90,000) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $10,280,651

Previous NEET Funding: None.

VIRGINIA - $4,666,197

University of Virginia - $1,599,000

- ***2 NEUP R&D Projects - $1,599,000.***
    1. **($800,000)** Researchers will study the long-term degradation mechanisms of SiC/SiC composites in helium coolant environments by slow crack growth (SCG). This will be achieved through multiscale testing in hot, O2-contaminated He and evaluation of the effect of SCG on hermeticity during in situ testing. Results will

be extended to predictive tow-level and component-scale SCG models and integrated into the development of ASME standards for use of SiC/SiC in nuclear reactors.

2. **($799,000)** Researchers will determine the root cause of corrosion within Kr-85 storage canisters in order to better understand current corrosion rates. The project will focus on expanding available research on Rb corrosion interactions and other contributing factors to better understand the corrosion phenomenon in current steel canisters

Previous NEUP/IUP Funding: None.

Previous NEET Funding: None.

Virginia Commonwealth University - $815,000

- ***1 NEUP R&D Project - $800,000.*** Researchers will perform separate-effects and system-wide tests of the AREVA and GE accident tolerant fuel concepts currently under consideration. The project will investigate the impact of cladding surface characteristics in critical heat flux (CHF) under normal and anticipated off-normal conditions. The experimental results will be used to develop and validate enhanced models for the prediction of CHF and will be implemented in various subchannel and system analysis codes.
- **2 IUP Scholarships - $15,000**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($446,797); 2 R&D projects ($1,670,000); 3 Fellowships ($465,000); 6 Scholarships ($37,500) – Awards made in 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $2,619,297

Previous NEET Funding: None.

Virginia Polytechnic Institute and State University - $2,252,197

- **1 NEET R&D Project - $1,000,000.** Researchers will develop a distributed acoustic fiber Bragg grating sensing (AFBGs) technology capable of monitoring multiple parameters, such as strain, temperature, pressure, and corrosion for structural health monitoring in nuclear facilities.
- **1 NEUP General Scientific Infrastructure - $290,000.** Equipment to characterize single and two phase flows in three dimensions to support V&V of simulation codes and to study dynamic corrosion in turbulent environments.
- **1 NEUP R&D Project - $799,697.** Researchers will foster the development of collaborative and intelligent technology that support adaptive/unplanned decision making during an outage, thereby reducing undesirable events arising from deficient coordination, communication, judgment or documentation. This research will involve concurrent research efforts on function analysis, natural language processing, scheduling and novel visualizations.

- **1 IUP Fellowship - $155,000**
- **1 IUP Scholarship - $7,500**

Previous NEUP/IUP Funding: 2 General Scientific Infrastructure ($524,935); 4 R&D Projects ($3,196,599); 2 Fellowships ($100,000); 4 Scholarships ($20,000) – Awards made in 2009, 2010, 2012, 2013 & 2014.
FY 2009 – FY 2016 total: $3,841,534

Previous NEET Funding: 1 NEET R&D Project (($1,000,000) – Award made in 2016.
FY 2012 – FY 2017 total: $1,000,000

WASHINGTON - $1,811,163

Pacific Northwest National Laboratory - $1,000,000

- **1 NEET R&D project - $1,000,000.** Researchers will design an ultrasonic sensor (and the associated instrumentation) for deploying at the TREAT reactor in support of transient testing of pre-irradiated nuclear fuel rods. The focus of the sensor design will be on high-speed (<1 ms) measurements of fuel deformation in-pile.
- **1 NSUF Access Only Project – *($30,000 in NSUF Facilities Access Only).*** Researchers will develop atomic scale data on the phase stability and thermo-mechanical properties of FeCrAl accident tolerant cladding under the combined effects of radiation and elevated temperature. The goal is to ultimately provide materials parameters for the MARMOT code and develop predictive physics-based models for the BISON code.

Previous NEET Funding: 1 NEET General Scientific Infrastructure Award ($500,000); 6 NEET R&D Projects ($5,374,560) – Awards made in 2012, 2013, 2014, 2015 & 2016.
FY 2012 – FY 2016 total: $5,874,560

Washington State University - $811,163

- **1 NEUP Reactor Upgrade - $11,163.** Washington State University will replace the existing 1970s-vintage Exhaust Gas Monitoring (EGM) system with a modern system. The original system will be retained as a backup.
- **1 NEUP R&D Project - $800,000.** Researchers will study the effects of simulated used nuclear fuel (UNF) chemistry and microstructure on its dissolution in geologic repository conditions. The results will advance models for UNF evolution in repository conditions, enabling reliable prediction of degradation and long-term performance of used nuclear fuel for up to one million years.

Previous NEUP/IUP Funding: 6 General Scientific Infrastructure ($857,583); 2 Reactor Upgrades ($179,844); 6 R&D projects ($5,211,695); 1 Fellowship ($150,000) – Awards made in 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $6,399,122

Previous NEET Funding: None.

WISCONSIN - $9,321,088

University of Wisconsin-Madison - $9,321,088

- **1 NEUP Integrated Research Project - $4,999,907.** Researchers will advance the technical state of compact heat exchangers and lay the foundation to get these types of heat exchangers certified for use in nuclear service. The team will advance the understanding of the performance, integrity and lifetime of the CHXs for use in any industrial application. This will be done by developing qualification and inspection procedures that utilize non-destructive evaluation (NDE) and advanced in-service inspection techniques, with insight from EPRI.
- **1 NEUP General Scientific Infrastructure - $304,721.** Glow Discharge - Optical Emission Spectrometer & Chemistry controlled recirculatory loop for the Environmental Degradation of Nuclear Materials Laboratory
- **1 NEUP NEET R&D Project – 1,000,000.** Researchers will develop a low temperature powder spray deposition process for: [i] the manufacture of fuel cladding of oxide dispersion strengthened (ODS) steels, and [ii] deposition of coatings (e.g., functionally-graded and multilayered coatings) to address corrosion, stress corrosion cracking (SCC), and wear in reactor components. This technology is amenable to large-scale manufacturing and will lower costs.
- **1 NEUP Reactor Upgrade - $61,460.** University of Wisconsin, Madison will replace health physics (HP) radiation monitoring equipment to support the operation and research.
- **4 NEUP R&D Projects - $2,800,000**
    1. **($800,000)** Researchers will develop extreme performance high entropy alloys (HEAs) as for new metal alloy cladding for fast reactor applications. Two very promising, single solution BCC HEAs will be investigated. The project will deliver an extensive irradiation resistance study of a new promising yet unexplored cladding concept.
    2. **($800,000)** Researchers will study critical heat flux (CHF) behavior focused on innovative accident tolerant fuel (ATF) cladding. The project includes separate effects screening tests to measure CHF for various ATF clad materials and surface characteristics with measurements of surface wettability. Pressurized flow boiling experiments will simulate prototypical reactor conditions for evaluating the best ATF clad materials coupled with CHF modeling.
    3. **($400,000)** Researchers will develop an advanced supercritical Brayton power cycle directly coupled to a fission reactor. The project will carry out a comprehensive optimization of the cycle operating conditions, working fluid, and configuration; develop detailed designs of each subcomponent; and demonstrate/develop critical technologies such as turbomachinery seals and bearings, reactor material corrosion and strength demonstrations, and supercritical heat transfer.

4. **($800,000)** The goal of the proposed research is to experimentally investigate radiation heat transport in molten salts, and to add functionality for radiative heat transport in a thermal-hydraulics system code. This includes obtaining highly resolved measurements of the optical absorption and emissivity of liquid salts.

- **1 IUP Fellowship - $155,000**

Previous NEUP/IUP Funding: 4 General Scientific Infrastructure ($957,029); 4 Reactor Upgrades ($754,319); 1 IRP ($3,000,000); 33 R&D projects ($24,297,754); 11 Fellowships ($1,585,000); 15 Scholarships ($77,500) – Awards made in 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016.
FY 2009 – FY 2016 total: $30,671,602

Previous NEET Funding: None.