FY2023 Distinguished Faculty Advancement Executive Summaries

Institution Name	Award Amount	Title of Grant Award
University of Massachusetts – Lowell	$ 600,000.00	Distinguished Faculty Advancement Program for Nuclear Materials at the University of Massachusetts Lowell
University of Illinois at Urbana - Champaign	$ 600,000.00	University of Illinois Nuclear Engineering Distinguished Faculty Advancement Program
Purdue University	$ 500,000.00	Faculty Advancement in Radiation Sensing, Detecting, and Responsive Materials
Clemson University	$ 600,000.00	Nuclear Materials Faculty Advancement at Clemson University
Utah State University	$ 600,000.00	Faculty Advancement Program to Integrate Junior Faculty in Nuclear Engineering Research at Utah State University
North Carolina State University	$ 600,000.00	Distinguished Faculty Advancement Program in Nuclear Engineering at North Carolina State University
University of Cincinnati	$ 600,000.00	Faculty Advancement Program at the University of Cincinnati to Advance Seismic Risk Assessment in Nuclear Engineering

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University of Massachusetts – Lowell

Distinguished Faculty Advancement Program for Nuclear Materials at the University of Massachusetts Lowell

Executive Summary:
A Distinguished Faculty Advancement Program is proposed for the University of Massachusetts Lowell to help support and strengthen its Nuclear Engineering Program in nuclear materials. Specifically, this faculty program will support a new tenure-track faculty member in areas including materials for advanced reactor systems and fuel cycles, and special nuclear materials, which will expand the range of expertise in NE and complement our existing capabilities in the radiological sciences program. The new initiative will lead to increased research and funding opportunities, increased collaborations with related disciplines at UML and other institutions, an increase in undergraduate and graduate student enrollment, and an increase in degree recipients entering the nuclear workforce with the much-needed expertise in nuclear materials.

The NE program at UMass Lowell is housed in the chemical engineering department which awards the only ABET accredited nuclear option for a bachelor's in chemical engineering in the U.S. Materials engineering is an integral part of the nuclear chemical engineering discipline which contributes uniquely to the nuclear fuel cycle, its facilities, and production/processing of special nuclear materials and waste forms. The proposed program is aimed at developing and retaining expertise in nuclear materials engineering as applied to nuclear fuel cycle chemical processes and advanced nuclear energy facilities. US universities currently have a lack expertise in the nuclear chemical engineering field in areas such as uranium chemical processing. The proposed faculty advancement program will greatly advance the activities of the NE program at UMass Lowell in supporting the mission of the NRC.

This program will collaborate with local initiatives to support opportunities for underrepresented students to engage in research, professional development, and community building. Consequently, there will be an increase in the number and diversity of degree recipients entering the nuclear workforce with expertise in nuclear materials, which is urgently needed for the development, licensing, and operation of advanced fission and fusion systems. To support this effort, UML recently created and filled a tenure-track faculty position in nuclear materials, which was concurrent with a $3M investment in laboratory renovations, infrastructure upgrades, laboratory space, and supercomputing resources that will support nuclear materials research. The university is further committed to full cost-sharing for the proposed Distinguished Faculty Advancement Program.

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University of Illinois at Urbana - Champaign

University of Illinois Nuclear Engineering Distinguished Faculty Advancement Program

Executive Summary:
This program is designed to help develop recently hired junior faculty members Assistant Professor Syed Bahauddin Alam and Assistant Professor April Novak. **Dr. Alam,** who got his doctoral degree from the University of Cambridge, works at the interface of advanced nuclear reactor design, materials, machine learning, digital twins, and cyber security. These are areas of high importance to NRC. **Dr. Novak** received her PhD from the nuclear engineering degree program with a minor in Computational Data Science and Engineering at the University of California, Berkeley. She then joined Argonne National Laboratory as the Maria Goeppert-Mayer Fellow in the Computational Sciences Division (ANL). Her work in the nuclear engineering area has focused on advanced nuclear reactor concepts and issues around development of computational tools for new nuclear reactor designs. She has also been conducting applied research in computational Thermal-Hydraulic (T/H) and Monte Carlo methods. These research areas are also of high importance to NRC.

The resources from this program will be used exclusively to help the two assistant professors—who joined our faculty in August 2023—establish productive university career in nuclear engineering education and research, and to support them to establish strong teaching, research, and professional service activities. The financial resources will be used for: (a) faculty summer salary support, (b) graduate student support associated only with the new faculty member, (c) acquisition of critical research and teaching equipment, and (d) travel and conference attendance. Matching support provided by the Department will be used for: (a) graduate students to work with the faculty research and teaching efforts, and (b) research facilities and lab remodeling support. The Department will also provide resources to support the development of the new faculty member, including mentoring, performance evaluation, teaching support, and research support.

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Purdue University

Faculty Advancement in Radiation Sensing, Detecting, and Responsive Materials

Executive Summary:
The objective of this proposal is to support a Faculty Advancement Program in Radiation Sensing, Detecting, and Responsive Materials at Purdue University. The NRC has identified numerous nuclear workforce gaps; and crosscutting all these gaps is the technical specialty of radiation sensing, monitoring, and detection. Hence, this program addresses this crosscutting workforce need by bolstering faculty in this area to complement Purdue's existing strengths in fuels, structural materials, mechanical behavior, and manufacturing of nuclear materials. The proposed program is a faculty development plan that is *vertically aligned* with institutional, nuclear workforce, and NRC priorities, and *horizontally aligned* across faculty priorities to achieve tenure and promotion. This program will support this integrated vertical and horizontal career development of two complementary tenure-track assistant professors in the area of radiation-responsive materials: one theorist recently hired, and an experimentalist to be identified through a current search. A novel component of the currently proposed program is that co-PIs Wharry and Okuniewski, whose careers were launched through previous NRC Faculty Development Grants, will provide specific mentorship to the new faculty members on how to build this current grant into sustainable funding from the nuclear research ecosystem.

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Clemson University

Nuclear Materials Faculty Advancement at Clemson University

Executive Summary:
This proposal seeks NRC resources to support our newly hired tenure-tracked faculty member, Dr. Cheng Sun, for the development of nuclear materials research and education at Clemson University. This NRC support will help this faculty member to establish a strong foundation for research, curriculum development, teaching, and mentoring. Dr. Sun's research focuses on advanced manufacturing of nuclear materials that are critical to nuclear power plants and development of artificial intelligence (AI) approaches in nuclear materials research. This research complements the existing expertise within multiple academic units at Clemson University, including Mechanical Engineering Department, Materials Science and Engineering Department, and the Center for Nuclear Environmental Engineering Sciences and Radioactive Waste Management (NEESRWM). Bridging the gaps allows us to develop more comprehensive research and education portfolios in nuclear science and engineering at Clemson University. Given the wide range of educational and research needs in the nuclear community, it is imperative to train the next-generation workforce for the nuclear industry and address the fundamental challenges in nuclear materials that have bottlenecked the development of advanced nuclear energy systems. Clemson University is one of the few universities in the nation with the licensing, safety protocols, and analytical infrastructure to train students to handle radioactive materials. This creates unique educational and training opportunities for students, preparing them for future careers in nuclear industry and academia. NRC resources will also support this new faculty member as they develop new curricula at both undergraduate and graduate levels, as well as advise graduate students. New courses, such as *Irradiation Damage and Effects in Materials* and *Nuclear Corrosion*, will be developed and offered in both the Mechanical Engineering (ME) and Materials Science and Engineering (MSE) Departments, and will be available to all students in the College of Science and College of Engineering, Computing, and Applied Science to include in the Nuclear Engineering and Radiological Science Minor. The success of this program will advance the education of nuclear science and engineering at Clemson University, develop a first-tier talent pipeline to nuclear industry, and support this new faculty member in enhancing his academic career in nuclear science and engineering.

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Utah State University

Faculty Advancement Program to Integrate Junior Faculty in Nuclear Engineering Research at Utah State University

Executive Summary:
Utah State University's (USU) Distinguished Faculty Advancement Program is focused on one tenure-track assistant professor that will strengthen and expand USU's nuclear materials and structures research and future workforce development efforts. Dr. Kouraytem's focus is on the characterization of the process-structure-property relationships in metallic structural materials fabricated using advanced manufacturing techniques, specifically additive manufacturing. Her research efforts support the nuclear energy industry in the quest to reduce material fabrication cost and increase the lifetime of structural components. Her research area complements and expands upon existing expertise within the Mechanical and Aerospace Engineering (MAE) department. Moreover, her research will be fully integrated into the USU Thermal Hydraulics and Materials Properties (TMP) Research. The proposed program has two goals, consistent with other past NRC-sponsored faculty development programs:

1. *To expand MAE's nuclear education capacity by cultivating research and teaching opportunities for junior faculty members with relevant experience in nuclear materials and manufacturing; and*
2. *To establish the new research program for each junior faculty member as integral elements of the TMP to further enable collaboration with federal agencies and non-federal entities and sustained long-term research success.*

As the previous USU Faculty Development Programs provided essential support enabling nuclear engineering research and education to achieve critical mass and momentum at USU, this new Distinguished Faculty Advancement Grant will continue to strengthen and expand USU's nuclear research and future workforce contribution to new levels.

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North Carolina State University

Distinguished Faculty Advancement Program in Nuclear Engineering at North Carolina State University

Executive Summary:
The Department of Nuclear Engineering at North Carolina State University (NCSU) previously awarded several NRC faculty development grants, currently named as 'Distinguished Faculty Advancement Program", which have been extremely beneficial to the development and success of our tenure-track faculty to advance in their academic careers. US News & World Report ranked our department ***THIRD*** among all nuclear engineering departments/programs nationwide.

We have focus area in advanced nuclear reactors and in all primary research areas in Radiation Science, Nuclear Power Design, Safety Analysis, Plasma Science and applications, Nuclear Materials, Waste Forms and Storage, Nuclear Security and Non-Proliferation, and Nuclear Computer Science. We successfully recruited and hired **FOUR** excellent new entry-level faculty (2 females and 2 mails), in addition to two preciously hired entry-level assistant professor (all eligible for NRC support).

The NRC Distinguished Faculty Advancement program will help us supporting the junior faculty. Upon hiring, and with the NRC award plus what we provide as a startup package, the hired junior faculty will be supported and helped to establish their academic career with the help of the senior faculty mentorship. Selected junior faculty for NRC support will receive supplemental finds from NRC. A measure of the NRC Distinguished Faculty Advancement award will be realized when the tenure-track faculty successfully advances towards tenure and promotion to higher ranks and earning a reputation within the nuclear engineering institutions. For our department of nuclear engineering, which is ranked number 3 among other nuclear departments nation-wide, it is a great benefit to hire top talent young faculty and retain them with our expansion in all nuclear engineering main thrust research areas. The NRC Distinguished Faculty Advancement program will support their educational activities, their mentoring of graduate students, and their progress towards tenure promotion.

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University of Cincinnati

Faculty Advancement Program at the University of Cincinnati to Advance Seismic Risk Assessment in Nuclear Engineering

Executive Summary:

The objective of this program is to provide a structured program to accelerate the career growth of the participating faculty with the support of NRC. The selected junior faculty will build a research program focusing on the probabilistic seismic hazard assessment for nuclear applications, which is aligned with the research priority of NRC for the performance assessment of nuclear structures. The project will provide the much-needed support for junior faculty to achieve excellence in teaching, scholarship, and service that align with the priorities and needs of NRC. The proposed project will advance the knowledge in seismic hazard assessment by integrating advanced dynamic computational modeling and probabilistic simulations and provide a risk-informed decision-making framework for structural safety and the long-term operation of nuclear facilities in the face of uncertainties.

The project will provide a comprehensive faculty development program to aid in faculty retention and success in the field of teaching, research, and service related to NRC missions. The project will enhance research capabilities at the University of Cincinnati to address the seismic and geotechnical challenges for NRC. The project will provide vital resources for the faculty member to develop a sustainable research program focusing on seismic risk assessment in nuclear engineering and achieve career goals (including tenure and promotion) at the University of Cincinnati. The project will also provide financial support for graduate student support, which will expose current and incoming civil engineering students to nuclear-related research to prepare them to enter the nuclear workforce in the future.

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