ORAU | **Partnership for Nuclear Energy**

Strengthening America's Global Leadership in Nuclear Energy

Nuclear Energy Academic Roadmap

Guiding Your Nuclear Educational Journey

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LETTER FROM MEGHAN MILLWOOD,

ORAU President and CEO

It is a pleasure to introduce the Partnership for Nuclear Energy (PNE) Nuclear Energy Academic Roadmap (NEAR), a collaborative effort aimed at strengthening the future of nuclear education and workforce capacity building in the United States. Led by the ORAU STEM Accelerator, this roadmap represents the combined expertise and dedication of educators, industry leaders, government agencies and other stakeholders working together to address one of the most pressing challenges facing the nuclear energy sector – building a skilled and resilient workforce.

The nuclear energy sector is at a turning point, with incredible opportunities to grow and innovate. The demand for clean, reliable energy is on the rise. Building a strong pipeline of skilled professionals able to meet this demand is more important than ever. The NEAR outlines how we can support students, educators and professionals at every stage of their journey, ensuring they have the tools and resources needed to succeed. By fostering collaboration across schools, universities, industries, non-profit organizations and communities, this roadmap helps pave the way to meet current and future workforce challenges.

I want to express my gratitude to everyone who contributed to the development of the NEAR. Your commitment to collaboration and innovation has been instrumental in creating a roadmap that will guide the development of the next generation of nuclear professionals. ORAU is proud to support this initiative, and I'm excited to see how it will shape the future of nuclear energy, laying the foundation for a workforce capable of driving innovation and ensuring the long-term success of nuclear energy in the United States.

Meghan Millwood

MEGHAN MILLWOOD
President and CEO, ORAU

LETTER FROM MICHELLE GOODSON,
OSA Director

On behalf of ORAU and the ORAU STEM Accelerator, I want to express my deepest gratitude to the exceptional team of collaborators who made the Nuclear Energy Academic Roadmap possible. Special thanks go to Lori Brady at the Nuclear Energy Institute and Olivia Blackmon, the former director of the ORAU STEM Accelerator, for the initial vision and support, and to lead authors Sue Magidson and Lyn Potter for their dedication and expertise in bringing this effort to life. Thank you to the many contributors and advisors who brought diverse perspectives and deep knowledge to the project. Coming from academic institutions, industry organizations and government agencies, this group's collective efforts enriched the roadmap and ensured it reflects the multifaceted needs of the nuclear energy sector.

This collaboration exemplifies the power of teamwork and shared purpose. By bringing together voices from across academia, industry and government, we've created a document that is not only comprehensive but also uniquely positioned to address challenges and opportunities in nuclear education and workforce development. To everyone who contributed their time, insights, and passion – thank you for helping to shape a resource that will guide the future of nuclear energy in the United States.

Michelle Goodson

MICHELLE GOODSON, SHRM-SCP
Director, ORAU STEM Accelerator

INTRODUCTION

The U.S. nuclear energy sector is at a crucial juncture, presenting exciting opportunities to grow and strengthen its workforce. As the demand for carbon-free, reliable energy continues to grow, the need to attract and retain highly skilled workers becomes increasingly important. Addressing this challenge is essential to achieving a clean energy future and supporting the deployment of advanced reactors, modernization of regulatory frameworks, licensing improvements, and a resilient supply chain. To meet future energy needs, the U.S. Department of Energy (DOE) projects the sector will require over 375,000 skilled workers by 2050 to sustain ongoing nuclear power operations and continue next-generation reactor deployment.[1] Further critical needs for skilled nuclear workers are in the national security and environmental management sectors, which draw from the same workforce as nuclear energy. Additionally, the transition of an aging academic workforce underscores the importance of cultivating new talent and effectively transferring knowledge to the next generation.

Graphic Credit: Lyn Potter and Nuclear News

Recognizing these needs, key industry organizations are coming together to develop proactive solutions. One such initiative is the Nuclear Energy Academic Roadmap (NEAR), which aims to strengthen pathways into nuclear careers, enhance educational infrastructure, and inspire a new generation of leaders in the field.

METHODOLOGY

To tackle the shortage of nuclear workers, workshops were held to brainstorm ideas on how to improve educational programs from early childhood education to higher education. These workshops aimed to find the best approaches to improve these programs. Goals included enhancing career awareness and pipeline development, assessing the financial support and other resources that academic institutions need, and optimizing academic resources including exploring new ideas to enrich education.

A total of 144 academic institutions participated, including 17 Kindergarten to 12th Grade (K-12) schools, 63 technical and community colleges, and 64 four-year institutions. Contributors were invited to participate based on their knowledge and interest in nuclear educational programs. They joined virtual sessions and used an online tool to provide feedback. Over 800 comments were collected and summarized by the ORAU Assessment and Evaluation team. The responses were categorized, themes identified, and subthemes elaborated through summaries, new ideas, and quotes from respondents. This information was documented in a qualitative analysis.

The qualitative analysis helped create a framework that shaped the organization and structure of the roadmap. Four strategic priorities emerged: Enhancing Nuclear Career Awareness; Supporting Pipeline and Pathway Development; Identifying Financial Support, Resources and Programs; and Optimizing Academic Resources Through Collaboration. A description of each is below.

- **Enhancing Nuclear Career Awareness** informs people about various jobs, career paths, and earning potential. It aids students in choosing careers in the nuclear industry and helps employees find growth opportunities.
- **Supporting Pipeline and Pathway Development** aims to grow the nuclear workforce by linking individuals to education training and career opportunities that support advancement at every stage.
- **Identifying Financial Support, Resources, and Programs** ensures that financial barriers do not hinder students from pursuing careers in the nuclear field and guarantees the continuity and effectiveness of educational programs.
- **Optimizing Academic Resources Through Collaboration** involves sharing adaptable educational coursework and tools, equipment, and facilities among learning institutions to save time and money while helping to ensure consistent learning experiences across various educational settings.

Initially, these priorities were assigned to six groups: K-12, Vocational-Technical Schools, Community Colleges, Four-year Academic Institutions, Advanced Studies, and Professional Development. Based on this structure, a summary or synopsis was prepared to outline the main messages and recommendations for each group within each priority. Upon further review, it was observed that several of the recommendations for Vocational-Technical Schools and Community Colleges were nearly identical, as were the recommendations for Four-year Academic Institutions and Advanced Studies. Therefore, a decision was made to merge the Vocational-Technical Schools with Community Colleges and Four-year Academic Institutions with Advanced Studies, reducing the number of groups to four.

THE NUCLEAR ENERGY ACADEMIC ROADMAP: A CONTINUOUS JOURNEY

This roadmap represents a journey that begins with a child's first exposure to science concepts and continues through decades of professional growth. Each educational level builds upon the previous while preparing learners for the next phase, creating a seamless progression from curiosity to expertise. Understanding these connections is essential for stakeholders at every level, from elementary teachers introducing basic energy concepts, to senior executives mentoring working professionals throughout their careers.

The following sections trace this educational journey, beginning with the foundational years that shape initial interest and understanding. While each level has unique characteristics and challenges, the four strategic priorities remain consistent throughout, adapted to meet the specific needs and capabilities of learners at each stage. While there may be some overlap, readers are encouraged to explore recommendations beyond their immediate interests, as useful advice might be found elsewhere.

Two appendices are provided. The first appendix identifies all recommendations in the NEAR and specifies whether they require national action or can be addressed at the regional or local level. The second appendix presents a strategic approach for implementing selected recommendations, with further examples to be added in future updates of the NEAR.

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Advancing the Journey:

From Application to Higher Education

Many vocational school and community college graduates join the nuclear workforce, while others choose to continue their education at four-year institutions. This transition is key for future engineers, scientists, and technical leaders who will design next-generation reactors, innovate fuel cycle technologies, and guide the evolution of advanced nuclear systems.

Moving from vocational training or community college to a four-year university requires careful planning and coordination to ensure credits transfer smoothly and studies continue without interruption. Students with vocational training bring valuable hands-on experience, excelling in laboratory and research settings, but may need support in theoretical coursework and research methodologies, underscoring the importance of robust articulation agreements and transfer support services. Universities also attract students who discover nuclear science through varied academic routes, such as community college transfers or those who change majors mid-way their academic journey. These varied entry points enhance classroom dialogue, enrich learning environments, and create a more resilient talent pipeline.

As students advance in their undergraduate education, many start thinking about graduate studies. This transition is crucial for developing future leaders and innovators in the nuclear field, tackling challenges like advanced reactor design, AI integration, and sustainable fuel cycles. However, many undergraduates are unaware of graduate opportunities in nuclear engineering or doubt their readiness. Without clear guidance, talented students might choose other fields that have higher profiles or are better funded. To keep these students in the nuclear field, institutions need to offer mentorship, research opportunities, and clear paths to graduate funding.

Graduate programs also benefit from students in various disciplines like materials science, computer science, environmental engineering, and mechanical engineering, who bring new perspectives to nuclear challenges. Their interdisciplinary skills are especially valuable in areas like nuclear cybersecurity, digital twins, and hybrid energy systems.

Seamless transitions along the education pathway—from technical schools and community colleges to universities, and from undergraduate to graduate study—cultivate a vital, steady continuum of resilient, innovative, and future-ready nuclear talent.

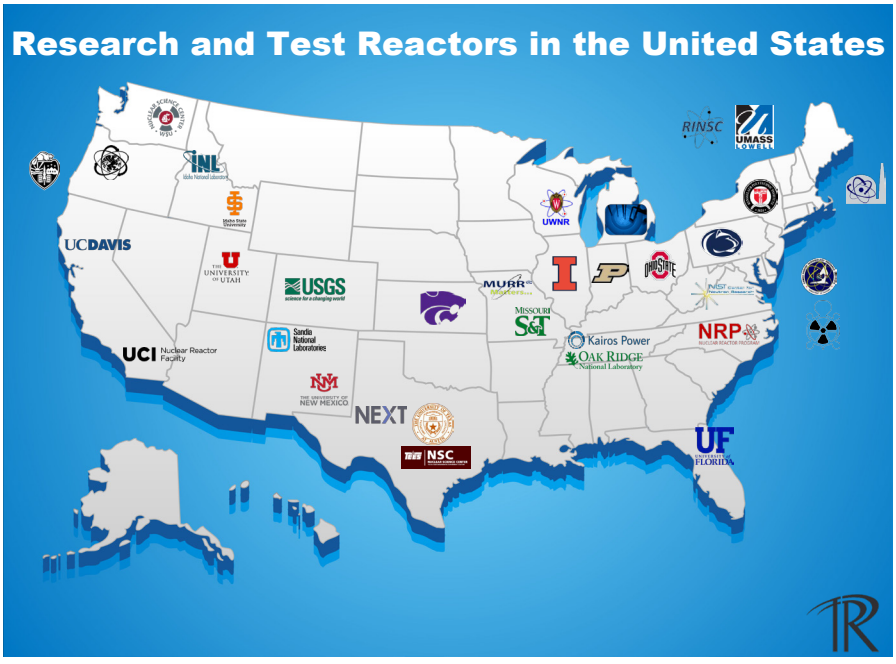
THE ROLE OF UNIVERSITIES

Universities are central to developing the nuclear workforce, offering foundational education and advanced studies that prepare engineers and scientists to ensure the safety of existing plants and lead innovation in advanced reactors, fuel cycles, and digital technologies. Enrollment in nuclear higher education is not keeping pace with predicted demand for workers in the nuclear industry. According to the most recent ORISE *Nuclear Engineering Enrollments and Degrees Survey*, between 2012 and 2022 nuclear energy bachelor's degrees conferred dropped 25%.[2] In 2022, the number of master's degrees awarded showed promising growth, increasing by 20% compared to 2021.[3] Despite this progress, the graduation rate remains 16% below the levels seen in 2019.[4] Therefore, more work in career pipeline and pathway development must be done to improve enrollment and graduation rates. Strategic initiatives, such as awareness campaigns, industry-academic partnerships, and early exposure to nuclear topics, are needed to inspire students to pursue advanced degrees and long-term careers in the field.

Graduate education and research are vital for equipping students with specialized knowledge in reactor design, regulatory modernization, and sustainable fuel management. The supply of nuclear industry knowledge-workers, such as engineers and project managers, is highly constrained.[5] This supply is further eroded by competition from adjacent industries like renewable energy, aerospace, and cybersecurity that value skills in technical disciplines, safety, compliance, and problem-solving.[6,7]

Curriculum modernization is also essential. Efforts to modernize curricula must address emerging skills in nuclear cybersecurity, digital twins, and hybrid energy systems while integrating sociotechnical factors such as political, ethical, and environmental considerations. Flexible learning tools, including augmented reality and digital twins, will be key to engaging future nuclear professionals.

Financial constraints further limit advanced studies, underscoring the need for continued investment in graduate research, national laboratory collaborations, and standardized open-access curricula. The U.S. Department of Energy Office of Nuclear Energy has responded to this challenge by investing over one billion dollars in nuclear education and research, supporting university reactor upgrades and outreach to K-12 and vocational institutions to raise awareness of nuclear science and technology.[8] Sustained funding will be critical to meeting the growing demand for trained nuclear professionals.



Graphic Credit: National Organization of Test, Research and Training Reactors

SUMMARY OF FINDINGS: UNIVERSITIES IN NUCLEAR WORKFORCE DEVELOPMENT

A robust nuclear workforce relies on a strong academic pipeline, from undergraduate to graduate studies. However, both levels face challenges that must be addressed through coordinated outreach, curriculum modernization, industry collaboration, and infrastructure investment.

1. **Outreach and Talent Attraction:** Meeting the nation's nuclear workforce needs requires attracting future engineers and scientists—yet many students remain unfamiliar with the field. Proactive outreach to students, families, and educational influencers is key to building interest and growing a robust talent pipeline in the face of strong competition from other STEM disciplines, especially in the area of advanced studies.
2. **Academic Capacity and Workforce Development:** A continued shortage of faculty, expertise, and resources in undergraduate and graduate programs limits the supply of qualified professionals entering the nuclear field. Expanding access to education and promoting economic mobility—especially for students with limited opportunities—will help strengthen the talent pipeline and increase participation across the nuclear industry.
3. **Curriculum Relevance and Interdisciplinary Training:** Academic programs must be regularly reviewed and updated to align with evolving industry needs. This includes integrating emerging topics like nuclear cybersecurity, digital twins and hybrid energy systems, AI, data science, and materials science. Studies should also include interdisciplinary training to prepare graduates for sociotechnical challenges including political, ethical, financial, and environmental influences on the nuclear industry.
4. **Industry and National Laboratory Partnerships:** Strong partnerships with nuclear facilities, national laboratories, and industry stakeholders ensure academic programs remain relevant, offer practical experience, and meet accreditation standards. These collaborations also support faculty development through joint appointments, visiting scholar programs, and shared research infrastructure.
5. **Specialized Equipment and Facilities:** Nuclear programs require access to costly, specialized infrastructure such as training reactors, radiation and materials labs, and simulation software. Sustaining these investments amid competing institutional priorities can be challenging. Strategic funding, public-private partnerships, and access to shared facilities are necessary to maintain and expand these capabilities.
6. **Experiential and Flexible Learning:** Hands-on learning is important at all levels. Programs should incorporate augmented and virtual reality tools, digital simulations and virtual control rooms. Internships and co-op programs with structured pre- and post-engagement phases are also needed. Flexible learning options such as online and hybrid courses can also improve accessibility and attract a broader range of students to advanced nuclear studies.

STRATEGIC RESPONSE: **FROM ANALYSIS TO ACTION**

Strategic Priority 1: Enhancing Nuclear Career Awareness

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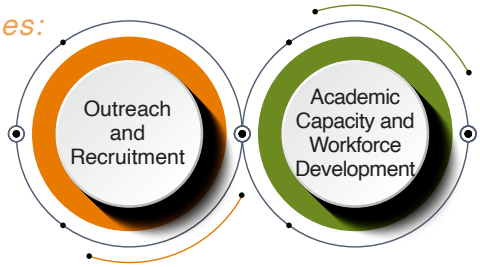

RECOMMENDATIONS:

- **Establish a Digital Hub:** Develop a centralized platform designed to facilitate outreach, career exploration, and access to educational resources. This hub will highlight nuclear careers across all levels, ranging from skilled trades to advanced degrees.
- **Develop Tiered Communication Strategies:** Launch targeted campaigns utilizing digital platforms, social media, and virtual reality to highlight nuclear career opportunities, compensation packages, and societal contributions. Tailor messaging for undergraduates and early-career professionals considering graduate studies.
- **Integrate Career Awareness into Curricula:** Incorporate nuclear career-related content into undergraduate general engineering and science courses to expose students from various disciplines to nuclear applications.
- **Promote Positive Perceptions of Nuclear Energy:** Implement consistent messaging across institutions to address misconceptions and highlight the role nuclear energy plays in providing a balanced energy portfolio and a reliable energy supply, addressing climate change, stimulating economic growth, and enhancing national security.
- **Showcase a Wide Spectrum of Career Role Models:** Develop outreach materials that feature modern nuclear professionals with varied journeys and skillsets to spark student interest and increase participation in the field.
- **Enhance Career Services and Mentorship Networks:** Expand university career services to include nuclear-specific job placement, internship and mentorship programs, and networking opportunities. Organize industry-led webinars and events to connect students with professionals.
- **Launch Ambassador and Mentorship Programs:** Recruit industry professionals and recent graduates to mentor students via school visits, webinars, and networking.

- **Strengthen Recruitment and Support Programs for Veterans and Emerging Talent:** Create targeted outreach and mentorship initiatives that leverage the specialized skills of veterans and professionals from nontraditional career paths, helping to drive innovation and expand the nuclear pipeline.

Strategic Priority 2:
Supporting Pipeline and Pathway Development

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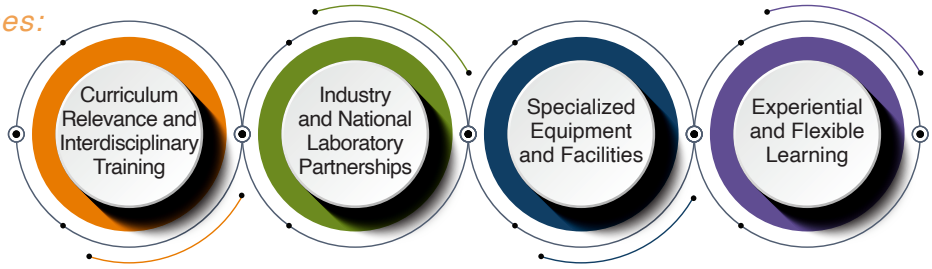

RECOMMENDATIONS:

- **Create Stackable Credentials and Certificates:** Offer modular credentials for nuclear and non-nuclear students that apply toward degrees and demonstrate competencies in topics such as nuclear safety, safeguards and security, quality assurance, and risk management.
- **Expand Experiential Learning Opportunities:** Provide internships, co-ops, and lab-based learning to undergraduate and graduate students. Use XR tools to simulate nuclear environments and provide students with a practical understanding of various aspects of the nuclear energy industry.
- **Integrate Advanced Nuclear Technologies into Curriculum:** Revise educational programs to include the latest advancements in technology, reactor designs, and sustainable practice, ensuring alignment with the evolving nuclear industry.
- **Integrate Sociotechnical Competencies:** Include coursework on the political, ethical, environmental, and financial dimensions of the nuclear energy industry to better prepare students for real-world challenges.
- **Develop or Enhance Internship, Mentorship, and Alumni Networks:** Create structured internship and mentorship programs and provide networking opportunities with industry representatives.
- **Provide Research Placement Opportunities:** Establish research opportunities for faculty and students to work with academia and national laboratories such as DOE's Faculty and Student Teams (FaST) Program and expansion of the Nuclear Energy University Program (NEUP).
- **Develop Leadership-Focused Graduate Programs:** Create advanced programs that cultivate leadership through strategic thinking, communication, and innovation training.
- **Foster Academic Pathways and Transfers:** Build articulation agreements between two-year and four-year institutions to support seamless academic progression.

- **Support Nontraditional Students and Career Transitions:** Provide outreach and academic support to individuals pursuing nuclear careers through alternative pathways—such as adult learners career changers and first-generation students—through partnerships with veteran initiatives and regional colleges.
- **Promote Faculty Exchanges and Industry Internships:** Enable faculty to stay current with industry trends through exchanges and internships, enhancing teaching and research relevance.
- **Establish Tri-Party Advisory Boards:** Form boards with representatives from academia, government, and industry to review and update curricula based on emerging technologies and workforce needs.
- **Implement Data Collection Program:** Collect data on educational outcomes, student outcomes, employment rates, and student/employer satisfaction to guide and refine program strategies.

Strategic Priority 3:
Identifying Financial Support, Resources, and Programs

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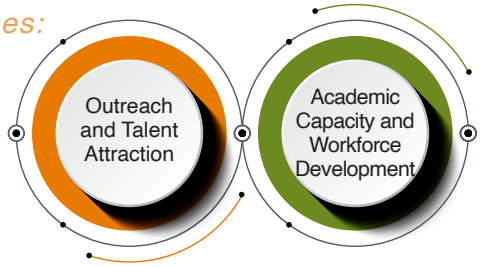

RECOMMENDATIONS:

- **Create Centralized Funding Portal:** Develop a national platform that lists scholarships, grants, internships, and fellowships specifically for nuclear education.
- **Expand Financial Aid and Subsidized Programs:** Offer expanded financial assistance in the form of scholarships, stipends, and paid internships, to draw new talent into the nuclear industry and ensure cost is not a barrier to participation.
- **Secure Long-Term Funding Commitments:** Develop strategic plans to ensure the continuity of funding through stakeholder engagement and adaptive planning.
- **Support Educator Development:** Provide externships and professional development funding for faculty to enhance instructional quality and industry alignment.
- **Pursue Collaborative Grant Opportunities:** Encourage joint funding proposals that link colleges, industry, and government to workforce development initiatives.

Strategic Priority 4:
Optimizing Academic Resources Through Collaboration

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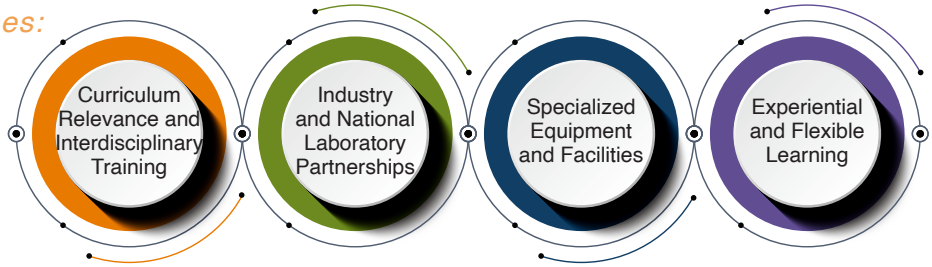
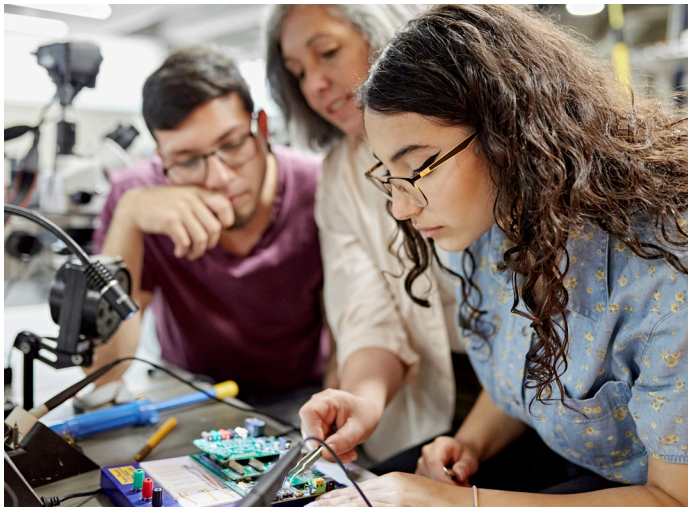


RECOMMENDATIONS:

- **Form Inter-Institutional Partnerships:** Build coalitions among vocational-technical schools, community colleges, and universities to share best practices, faculty expertise, and curricular resources.
- **Host Curriculum Innovation Summits:** Facilitate regular gatherings for educators to co-create content, share advancements, and pilot new instructional tools.
- **Establish Academic Consortia:** Form university consortia (e.g., ORAU University Partners Nuclear Innovation Cluster) to jointly develop and share online courses, lab simulations, and curriculum materials.
- **Create an Open Educational Resource Repository:** Fund and centralize access to adaptable, high-quality nuclear education content for institutional use.
- **Standardize Introductory Courses:** Develop open-source foundational courses to ensure consistent knowledge across institutions.
- **Establish Industry Advisory Boards:** Form advisory boards with industry representatives to review and update curricula based on emerging technologies and workforce needs.
- **Leverage Federal Reactor Sharing and Training Programs:** Expand the use of programs like Modeling, Experimentation and Validation (MeV) Summer School, Small Modular Advanced Reactor Training (SMART), and DOE Reactor Sharing to provide hands-on reactor training.
- **Develop Train-the-Trainer and Pedagogical Programs:** Provide faculty and graduate students with teaching skills and digital tools (e.g., digital twins, simulators) to improve instruction.
- **Establish Institutional Mentorship Networks:** Connect emerging programs with established institutions to assist with curriculum development and resource planning.
- **Foster a Culture of Continuous Learning:** Promote professional development through workshops, seminars, and adaptive learning strategies.



COMPLETING THE JOURNEY:
A HOLISTIC APPROACH TO NUCLEAR WORKFORCE DEVELOPMENT

The professional development phase completes the nuclear workforce pipeline while also contributing to its renewal. Experienced professionals act as mentors, interactive presenters, and industry advisors for academic programs at every level, offering real-world insights that enrich classroom learning and inspire the next generation of nuclear professionals. This relationship—where industry professionals contribute to educational programs that, in turn, prepare their future colleagues—creates a sustainable ecosystem for nuclear workforce development.

The success of this system relies on strong, ongoing partnerships among all stakeholders: K-12 educators who plant the seeds of interest, vocational school/community college instructors who develop practical skills, university faculty who advance scientific knowledge, and industry professionals who apply this knowledge to address real-world challenges. Each level supports and depends on the others, creating a robust pipeline that can adapt to changing industry needs while maintaining the high standards of safety and excellence characteristic of the nuclear profession.

As the nuclear industry encounters new opportunities, from advanced reactor deployment to the growing recognition of nuclear energy's role in addressing global challenges, the strength of this educational pipeline will determine whether the U.S. can capitalize on these opportunities. The recommendations in this roadmap provide a framework for strengthening each stage in the pipeline, ensuring robust and effective connections between levels to support student achievement and highlight the success of workforce development initiatives.

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Appendix A

Nuclear Energy Academic Roadmap Recommendations

The following four tables correspond to the Strategic Priorities outlined in the NEAR report. Each table presents a set of recommendations, categorized by group, and identifies whether it should be addressed at the national level, regional/local level, or both. To avoid redundancy, overlapping recommendations within the Strategic Priorities have been consolidated.

Strategic Priority 1:
Enhance Career Awareness

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Expose K-12 Students to Nuclear Energy Fundamentals	●				●	
Integrate Nuclear Career Exploration into Curriculum	●				●	
Develop Unified Messaging Across Education Levels to Address Misconceptions and Promote the Benefits of Nuclear Energy	●	●	●		●	●
Highlight a Range of Professional Journeys	●	●	●		●	●
Develop a Digital Hub		●	●		●	●
Integrate Nuclear Career Pathways into Academic Programs		●	●		●	
Offer or Expand Experiential Learning Opportunities		●	●	●	●	
Provide or Enhance Career Counseling and Support Services		●	●	●	●	
Establish Nuclear Industry Ambassador Programs		●	●			●
Enhance Career Services and Mentorship Networks		●	●		●	
Create Interactive Career Pathway Tools		●			●	
Foster Community and Industry Engagement		●			●	
Develop Tiered Communication Strategies			●		●	●
Implement Targeted Communication Strategies				●	●	

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Develop Centralized Digital Platforms				●	●	●
Foster Tri-Sector Partnership Councils			●	●	●	●
Strengthen Recruitment and Support Programs for Veterans and Emerging Talent		●	●	●	●	●

Strategic Priority 2:
Support Pipeline and Pathway Development

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Develop Reproducible STEM Programs	●				●	●
Partner Educators with Industry Experts	●				●	
Introduce Nuclear Safety Culture	●				●	
Offer or Expand Experiential Learning Opportunities and Bootcamps	●	●	●	●	●	●
Implement Multi-Channel Outreach	●	●	●		●	●
Expand Dual Enrollment and Early College Programs		●			●	
Develop Stackable Credential Programs and Certificates		●	●	●	●	●
Support for Emerging Talent		●	●		●	●
Develop Internships and Mentorship Programs and Alumni Networks		●	●		●	●
Establish Pre-Apprenticeship and Apprenticeship Programs		●			●	●
Foster Academic Pathways and Transfers and Formalize Transfer Pathways		●		●	●	
Integrate Advanced Nuclear Technologies into Curricula		●	●	●	●	●
Implement Data Collection Program and Track Outcomes and Share Successes			●	●	●	●

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Integrate Sociotechnical Competencies in Curriculum			●	●	●	●
Provide Research Placement Opportunities			●		●	●
Develop Leadership-Focused Graduate Programs			●		●	
Promote Faculty Exchanges and Industry Externships			●		●	
Establish Industry Advisory Boards		●	●		●	
Broaden Access to Training				●	●	●
Establish Regional Training Hubs				●	●	●
Update Training Curriculum Regularly				●	●	
Create Career Mapping Tools				●		●
Formalize Mentorship and Peer Learning				●	●	
Offer Detail Assignments and Rotational Programs				●	●	
Leverage Professional Expertise				●	●	
Integrate Advanced Learning Technologies into Training				●	●	

Strategic Priority 3:
Identify Financial Support, Resources, and Programs

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Develop a Centralized Funding Portal	●	●	●	●		●
Engage Industry and Government Partners	●	●	●		●	●
Expand Student Financial Support, Financial Aid, and Subsidized Programs	●	●	●		●	●
Develop a Strategic Sustainability Plan to Secure Long-Term Funding	●	●	●	●	●	●
Coordinate Work-Study and Part-Time Opportunities		●			●	
Provide Wraparound Support Services		●			●	
Pursue Collaborative Grant Opportunities		●	●		●	
Identify and Secure Funding		●			●	
Secure Long-Term Funding Commitments			●		●	●
Support Educator Development		●	●		●	●
Advocate for Dedicated Funding Streams				●	●	
Offer Financially Supportive Programs				●	●	●
Leverage Career Centers and Online Resources				●	●	
Encourage Professional Association Memberships				●	●	

Strategic Priority 4:
Optimize Academic Resources Through Collaboration

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Raise Awareness and Promote Existing Programs	●				●	
Create an Open Educational Resource Repository	●	●	●	●	●	●
Develop Standardized Introductory Courses		●	●	●	●	●
Establish a Consortium for Online Learning	●				●	
Develop National Teaching Guidelines	●					●
Foster/Promote a Culture of Continuous Learning	●	●	●	●	●	
Form Inter-Institutional Partnerships		●	●		●	
Expand Access to Shared Facilities and Leverage Federal Reactor and Training Programs		●	●		●	●
Establish and Institutionalize Faculty Mentorship Networks		●	●	●	●	
Invest in Faculty Development		●			●	
Host Curriculum Innovation Summits		●	●		●	●
Establish a National Advisory Board at the Federal Level		●	●			●
Establish Academic Consortia			●		●	●
Develop Train-the-Trainer and Pedagogical Programs			●		●	

Recommendation	K-12	Vo-Tech / Community College	University	Professional Development	Local / Regional	National
Strengthen Academic-Industry Partnerships				●	●	
Establish a Consortium for Online Learning				●	●	●
Incorporate Experiential and Immersive Learning				●	●	

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Appendix B

Nuclear Energy Academic Roadmap Example Implementation Methods, Tools and Resources

The following four tables align with the Strategic Priorities outlined in the NEAR Report. The tables include example recommendations, implementation strategies, and possible tools and resources. Future updates of the NEAR Report will provide more examples.

Strategic Priority 1:
Enhance Career Awareness

Recommendation: Develop Unified Messaging Across Education Levels to Address Misconceptions and Promote the Benefits of Nuclear Energy

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University	• Collaborate with non-governmental organizations (e.g., NEI, ANS, EPRI, ORAU PNE) and academic partners to standardize messaging • Develop a national branding campaign to promote the benefits and career pathways of nuclear energy • Develop and distribute informational materials (e.g., brochures, videos, digital content) tailored for diverse audiences • Ensure all outreach materials highlight current and emerging career opportunities in the nuclear sector • Share resources with schools, community organizations, and workforce partners nationwide • Host career fairs, webinars, and information sessions for students, families, and community members	• Nuclear industry websites - American Nuclear Society (ANS): https://www.ans.org/ - Nuclear Energy Institute (NEI): https://nei.org/ - World Nuclear Association: https://world-nuclear.org/ - International Atomic Energy Agency (IAEA): https://www.iaea.org/ - Nuclear Regulatory Commission (NRC): https://www.nrc.gov/ - Nuclear Innovation Alliance: https://nuclearinnovationalliance.org/ • Educational curricula and learning resources - ANS Navigating Nuclear Curriculum • National Energy Education Development curriculum • Virtual nuclear reactor tours (video or 3D) • Digital media and communication platforms - Social media platforms (e.g., LinkedIn, X, Instagram, TikTok) - Video hosting platforms (e.g., YouTube, Vimeo) - Podcasts focused on science, technology, and energy - Online webinar platforms (e.g., Zoom, Microsoft Teams) • Public engagement opportunities - National Science Week and other STEM-focused public events - Virtual or in-person outreach sessions for schools and community groups

Recommendation: Highlight a Range of Professional Journeys

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University	• Create video interviews and written profiles of professionals from varied backgrounds • Share stories through university, industry, and social media channels • Hold community events and school visits highlighting the benefits of a diverse workforce • Partner with professional societies for outreach events • Partner with institutions and schools serving a wide range of students	• Online platforms for hosting webinars (e.g., Zoom) • Social media platforms • Video hosting platforms (e.g., YouTube) • Industry conference • School-sponsored events • Nuclear Science Week • Boy and Girl Scouts merit badge workshops

Recommendation: Integrate Nuclear Energy Awareness into Broader STEM initiatives

Groups	Implementation Strategies	Tools & Resources
K-12	• Partner with STEM organizations to create and incorporate nuclear energy modules • Develop nuclear energy-focused workshops and activities at STEM fairs and events	• STEM organizations (e.g., Project Lead the Way, For Inspiration and Recognition of Science and Technology, Women in Science, ORAU K-12 STEM Education Programs) • STEM curricula providers • STEM fair organizers • Online learning platforms • National Science Week toolkits

Recommendation: Provide or Enhance Career Counseling and Support Services

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University Prof. Devel.	• Establish formal career counseling and mentoring programs • Offer resume workshops and interview coaching • Host career fairs and information sessions • Maintain a job/internship board specific to nuclear careers • Assign dedicated career counselors • Establish mentorship programs tied to professional organizations	• Career offices and staff • American Nuclear Society: ans.org • Nuclear Energy Institute: NuclearWorks.org • Center for Energy Workforce Development: cewd.org/resources, getintoenergy.org • Nukeworker.com/job

Recommendation: Provide Research Placement Opportunities

Groups	Implementation Strategies	Tools & Resources
University	• Establish formal agreements for student research placements • Create joint research projects and internships • Establish summer research internships at national labs • Promote student participation in DOE/NEUP and NRC-funded projects	• Existing legal and partnership frameworks • Placement coordinators

Recommendation: Strengthen Recruitment and Support Programs for Veterans and Emerging Talent

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University Prof. Devel.	• Partner with veterans' organizations and develop veteran-specific outreach and transition programs • Highlight transferable skills in recruitment activities • Offer scholarships and transition support (e.g., targeted transition workshops) • Offer credit for military experience	• Veterans Affairs offices – liaison staff • Transition program guides • Partnerships with Veteran groups • Industry mentors

Strategic Priority 2:
Support Pipeline and Pathway Development

Recommendation: Create/Offer/Expand Experiential Learning Opportunities and Bootcamps

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University Prof. Devel.	• Partner with organizations that have created internship, mentorship, and summer programs for students • Integrate AR/VR modules in education and training • Host virtual reality tours and simulations • Integrate industry site visits, hands-on labs, and facility tours into curriculum • Partner with industry to obtain case studies for use in the classroom	• Existing experiential learning frameworks (e.g., Kolb's Experiential Learning Cycle) • Immersive learning tools (e.g., GE Hitachi Virtual Reality Solution, AR Deni) • Online learning platforms (e.g., Riipen.com) • Educational websites and databases (e.g., IAEA's Nuclear Energy Education Resource Hub, ScienceEducation.gov) • Simulations and interactive tools (e.g., PhET Interactive Simulations) • Virtual nuclear reactor tours (video or 3D)

Recommendation: Develop or Enhance Internship and Mentorship Programs and Alumni Networks

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University	• Expand partnerships with companies for internship and co-op placements • Develop formal mentorship networks • Establish a phased internship program with pre-and post-internship activities to better prepare and retain students • Formalize and establish a communication plan for mentorship programs • Encourage graduate students to act as mentors • Organize peer learning forums and technical exchanges	• University career services and alumni associations • Professional organizations (e.g., ANS) • Government agencies and programs (e.g., NRC, DOE) • Online platforms and software (e.g., Engage2Serve, Pathways to Career Success, Zintellect.com)

Recommendation: Develop Stackable Credential Programs and Certificates

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University Prof. Devel.	• Partner with academic institutions, trade unions, and workforce boards • Develop curriculum and certification standards • Advertise availability of programs/ certificates	• "Stackable Credentials Tool Kit-Mapping Upward", Center for Occupational Research and Development, April 2018 • Apprenticeship program templates • Certification bodies • Industry trainers

Recommendation: Provide Research Placement Opportunities

Groups	Implementation Strategies	Tools & Resources
University	• Establish formal agreements for student research placements • Create joint research projects and internships • Establish summer research internships at national labs • Promote student participation in DOE/NEUP and NRC-funded projects	• Existing legal and partnership frameworks • Placement coordinators • Utilize existing resources like the DOE ORISE Program and Zintellect.com

Recommendation: Integrate Advanced Nuclear Technologies into Curricula and Update Training Curriculum Regularly

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University Prof. Devel.	• Contact nuclear organizations (e.g., NEI, ANS), to identify subject matter experts from industry and academia • Partner with subject matter experts and create modules to be used in established courses or summer programs	• NRC training materials • EPRI programs • Online DOE STEM Resources • Workshops (e.g., DOE/NNSA and Gateway for Accelerated Innovation in Nuclear (GAIN))

Recommendation: Establish Industry Advisory Boards

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University	• Define purpose and scope of the board • Work with professional organizations to identify and recruit members • Establish clear expectations and structure • Create an onboarding process • Manage board activities and outcomes	• Existing advisory boards and committees (e.g., TN Nuclear Energy Advisory Council, Advisory Committee on Reactor Safeguards, PNE Advisory Council) • Federal Advisory Committee Act • NRC Best Practices and Guidelines Reports to Congress

Strategic Priority 3:
Identify Financial Support, Resources, and Programs

Recommendation: Develop a Centralized Funding Portal

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University Prof. Devel.	• Coordinate with industry and government agencies to collect information on funding opportunities • Contact nongovernmental agencies or not-for-profit organizations to determine who would manage and maintain the database and set up its functionality • Create and launch a database listing scholarships, grants, and internship opportunities • Regularly update and promote funding opportunities to students and educators • Offer application workshops to students	• Development frameworks • Management software • Funding discovery and tracking tools • Web analytics • Social media management • Generative AI • NSF – Advanced Technical Education - Mentoring services for grant writing: - Mentor Connect: http://mentor-connect.org - Mentor Links: http://www.aacc.nche.edu/programs/mentorlinks/ - Mentor Up: https://atementorup.org

Recommendation: Develop a Centralized Funding Portal Engage Industry and Government Partners

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University	• Partner with industry to provide in-kind and financial support of nuclear education programs and resources • Partner with government agencies for financial support of nuclear education programs and resources	• Requests for Information • Industry days • One-on-one meetings • Industry and government association meetings • Trade groups • Conferences • NSF-ATE Business and Industry Leadership Team: https://connectedtech.org/business-industry-leadership-team/

Recommendation: Expand Student Financial Support, Financial Aid, and Subsidized Programs

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University	• Increase university and industry-sponsored scholarships • Apply for federal and state grants	• Promote and expand federal and state financial aid programs • Institutional scholarships and grants • Tuition assistance programs • Employer and Union assistance programs • Online scholarship databases (e.g., scholarships.com, financialaidtoolkit.ed.gov)

Recommendation: Develop a Strategic Sustainability Plan to secure long-term funding

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University Prof. Devel.	• Develop long-term funding strategies • Advocate for government and industry investment • Seek grant funding	• Building partnerships and collaborations • Online courses and workshops • Guidance from experts

Recommendation: Support Educator Development

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University	• Establish partnerships across academic institutions and identify educator needs • Create summer externships • Create research opportunities for educators	• Online learning platforms and courses • Professional development organizations, such as ORAU K-12 STEM Educator Programs • Conferences, workshops, bootcamps • Collaboration and mentorship

Strategic Priority 4:
Optimize Academic Resources Through Collaboration

Recommendation: Create an Open Educational Resource Repository

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University Prof. Devel.	• Determine which non-governmental or not-for-profit organization will create, manage, and maintain repository • Evaluate existing open educational platforms and perform a gap analysis to identify unmet needs • Collaborate with industry and government agencies to collect, curate, and develop high-quality curriculum materials • Develop a searchable online database • Promote and communicate availability of resource repository to educators, institutions, and stakeholders	• Existing open educational resource platforms such as: - IAEA's e-learning platform - IAEA NUCLEUS information resource portal - DOE Fundamentals Handbook - Open Educational Resource: oercommons.org - Open.edu/openlearncreate - MIT OpenCourseWare - DOE's website: energy.gov/doe-stem - NRC's website: https://www.nrc.gov/reading-rm/ - ANS's website: nuclearconnect.org - Nuclearscienceweek.org - Idaho National Laboratory (INL) Education Resources: inl.gov/education - NSF-ATE Regional Center for Nuclear Education & Training: https://gonuke.org/ - ORAU K-12 STEM Education Lesson Plans: https://orau.org/k12/educator/lesson-plans.html

Recommendation: Develop Standardized Introductory Courses

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University Prof. Devel.	• Establish a partnership with representatives from academia, industry, and government • Perform foundational planning • Develop course content and learning activities • Establish a peer review process • Collect feedback and make improvements	• Existing open educational resource platforms • Existing introductory courses from selected universities and organizations

Recommendation: Foster/Promote a Culture of Continuous Learning

Groups	Implementation Strategies	Tools & Resources
K-12 VO-TECH / CC University Prof. Devel.	• Offer micro-credentials • Host regular professional development seminars • Encourage attendance at conferences and seminars • Encourage lifelong learning incentives	• Existing technology including online learning platforms, VR/AR, data analytics, mentorship programs • In-house workshops, seminars, and on-the-job training • Government and industry specialized training (e.g., Westinghouse Nuclear)

Recommendation: Establish and Institutionalize Faculty Mentorship Networks

Groups	Implementation Strategies	Tools & Resources
VO-TECH / CC University Prof. Devel.	• Evaluate and expand existing mentorship programs and networks to support new training initiatives • Facilitate knowledge transfer between institutions through formal or informal agreements • Pair emerging programs with experienced mentors to guide curriculum and workforce alignment • Provide guidance on program development based on best practices	• Mentorship guides and handbooks • Mentorship programs and models (e.g., National Research Mentoring Network)

www.orau.org

ORAU. (2025). *Nuclear Energy Academic Roadmap: Guiding Your Nuclear Educational Journey*. https://www.orau.org/nuclear-energy-academic-roadmapl.