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ASUW PASSED Student Government

SENATE RESOLUTION #3008

TITLE: ASUW Supports the Creation of a Graduate Nuclear Energy Science Certificate

DATE INTRODUCED: 10/22/24

AUTHOR: Senator Morales

SPONSORS: President Murfitt, Chief of Legislative Affairs Bouma, Chief of Staff Hennigar, Senators Christensen, Harper, Jackim, Keasling, Langford, Rzeszut, and Shosh

1. WHEREAS, the purpose of the Associated Students of the University of Wyoming
2. (ASUW) is to serve our fellow students in the best manner possible; and,
3. WHEREAS, the Graduate Nuclear Energy Science Certificate gives students who
4. want to pursue careers in nuclear fields the chance to earn a credential requiring a strong
5. technical background in nuclear energy science and technology; and,
6. WHEREAS, there are currently no undergraduate or graduate minors, majors, or
7. certificates based on nuclear sciences; and,
8. WHEREAS, there are increasing opportunities in the state and region dealing with
9. nuclear energy and science; and,
10. WHEREAS, TerraPower is building a new advanced nuclear reactor in Southwest
11. Wyoming that is fueling excitement about nuclear energy in the state of Wyoming; and,
12. WHEREAS, adding a Graduate Nuclear Energy Science Certificate will make the
13. University of Wyoming more competitive; and,
14. WHEREAS, the certificate will be a two-year program that will require 15 credit hours
15. consisting of 6 required core courses and 9 elective courses which are listed in
16. Addendum A; and,
17. WHEREAS, the program follows a general track outlined by the Feasibility Study in

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18. Addendum A; and,

19. WHEREAS, the program will have a launch date of Fall 2025; and,

20. WHEREAS, there is a demand for this type of program based on the Graduate Nuclear

21. Energy Science Certificate Feasibility Study document, found in Addendum A; and,

22. WHEREAS, there is a lot of support for this program both within and outside of the

23. University as outlined in Addendum A and Addendum B; and,

24. WHEREAS, the program requires minimal new resources, the required facilities are

25. already under construction, and the program will fall under the School of Engineering

26. and Physical Sciences.

27. THEREFORE, be it resolved by the Associated Students of the University of Wyoming

28. (ASUW) Student Government that we support the implementation of Graduate Nuclear

29. Energy Science Certificate; and,

30. THEREFORE, be it further resolved that this resolution be circulated to the student

31. body through ASUW channels; and,

32. THEREFORE, be it further resolved that this resolution be sent to the Board of Trustees

33. and all corresponding departments immediately upon passage.

Referred to: **All Standing Committees**

Date of Passage: October 29th,2024 Signed: _____

(ASUW Chairperson)

"Being enacted on October 29th, 2024**, I do hereby sign my name hereto and approve this**

Senate action." _____

ASUW President

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Addendum A
Graduate Nuclear Energy Science Certificate Feasibility Study

University of Wyoming
School of Energy Resources
College of Engineering and Physical Sciences
Graduate Nuclear Energy Science Certificate Feasibility Study

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Executive Summary

Degree or Certificate Title: **Nuclear Energy Science**

Level of Degree or Certificate: **Graduate**

Delivery Mode(s): **Traditional, Face-to-Face in Laramie, WY**

Estimated Startup Cost of Degree: **Up to $52,000/yr for supplemental instruction and advising (includes proposed undergraduate and graduate certificates and will be covered by SER)**

Anticipated Launch Date: **Fall 2025**

Description: **Students in this certificate program would complete 15 credit hours of coursework within a 2-year span. The coursework will consist of a 2-course core series in nuclear energy science fundamentals and reactor design, supplemented by 3 elective courses covering different topical areas relevant to nuclear energy. The core series will expand upon the "Fundamentals of Nuclear Energy" course, which was successfully launched by the School of Energy Resources (SER) in Fall 2023 and Fall 2024. The electives will include new nuclear-relevant course offerings across several departments within UW. The certificate will be offered in person with hybrid options explored at instruction discretion. This certificate program will create new opportunities to compete for employment in the field of nuclear energy for UW students pursuing relevant technical degrees. These certificates are built in collaboration between SER and the College of Engineering and Physical Sciences (CEPS).**

Overview and Description of Degree or Certificate, Purpose, Strategic Plan

Certificate's Objectives

The objective of this certificate program is to provide UW students interested in pursuing careers in nuclear fields the opportunity to earn a credential requiring a strong technical background in nuclear energy science and technology.

Fit

There are currently no nuclear-focused certificate, minor, or major degree programs at UW. However, there are an increasing number of opportunities within the state and region for students graduating with currently offered degrees (e.g., Mechanical Engineering, Chemical Engineering, Civil Engineering, etc.) to engage with the nuclear energy industry upon graduation. The proposed nuclear-focused graduate certificate program will leverage current faculty, new hires, and temporary lecturers, through generous philanthropic support, to make UW graduates more competitive for these opportunities.

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Context and Rationale

TerraPower's recent decision to build an advanced nuclear reactor in Wyoming has created a great deal of excitement surrounding nuclear energy within the state. It has also generated interest and excitement from UW students. Unfortunately, UW currently offers little in the way of nuclear-energy focused coursework to prepare our students to engage with the state's burgeoning nuclear industry upon graduation. In fact, beyond geologic research on uranium resources, nuclear energy has not been a strong focus at UW in recent years. For many reasons, an increased emphasis on nuclear energy scholarship, outreach, and instruction is emerging at UW.

To support the development of a 'nuclear energy collaboration and training program', the Wyoming legislature appropriated $2 million to the School of Energy Resources in the 2022 legislative session. Using some of this financial support, the School of Energy Resources (SER) launched the Nuclear Energy Research Center (NERC) via a competitive RFP to select faculty co-directors. Caleb Hill, Associate Professor in Chemistry and JE Warren Chair in Energy and Environmental Policies and a Neilson Faculty Fellow, and Tara Righetti, SER Professor of Law and Occidental Chair in Energy and Environmental Policies, were selected as the inaugural co-directors of NERC, recognizing the need for a multi-disciplinary approach to nuclear energy instruction and scholarship. NERC is focused on increasing the capacity around nuclear energy at UW.

In addition to growing research capabilities, creating a shared laboratory space, hosting conferences to increase network and collaboration with nuclear energy leaders, NERC has been leading discussions on the educational and instructional needs surrounding nuclear energy in Wyoming. These discussions have included engagement with industry partners including TerraPower and BWXT, elected Wyoming officials, mining industry representatives, academic leaders in nuclear energy and more. In discussions with these partners, a few key themes have emerged:

1. **A majority of the potential job opportunities for UW graduates do not require a degree in nuclear engineering.** The key distinction between nuclear power and more traditional forms of thermal power generation (e.g., coal or gas) is in how heat, which may be converted to electricity or utilized directly, is produced. Rather than burning fuel, heat is generated within the core of a nuclear reactor. While reactor core design is the realm of nuclear engineers, all other technical aspects of nuclear power generation are addressed by other disciplines. Both TerraPower and BWXT have emphasized that a majority of the university graduates they hire are *not* nuclear engineers, but instead come from disciplines covered by existing degree programs at UW (mechanical engineering, chemical engineering, physics, etc.).
2. **A credential which demonstrates nuclear literacy would help make UW graduates more competitive.** While there may be ample nuclear energy related employment opportunities for students in currently offered UW degree programs, UW students will

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be at a disadvantage to those that have a demonstrated an educational background in nuclear energy. Providing UW students with a modest amount of relevant nuclear coursework would greatly improve the competitiveness of their applications, based on conversations with our industry partners.

The first step taken to increase nuclear-specific coursework at UW has been through the 'Fundamentals of Nuclear Energy' course, which is being taught by an SER adjunct faculty member and funded by Idaho National Laboratory. The initial offering of this course had 24 students enrolled, demonstrating interest in nuclear-focused coursework among our student body, especially given the difficulty of this course. While this course represents an improvement, without additional instructional options, UW students remain at a disadvantage (based on conversations between SER/CEPS and industry) for securing positions with nuclear-focused companies and national labs without equal or substantial coursework offered. Establishing a nuclear-focused certificate to supplement existing undergraduate and graduate degree programs at UW would be an effective approach to serve UW students interested in employment within the nuclear energy field and increase the competitiveness of UW students for careers in the nuclear energy sector in Wyoming and beyond. The potential value for UW students has been emphasized in accompanying letters, see Appendix A of support from both Idaho National Laboratory and TerraPower, both of which are heavily invested in the development of advanced nuclear systems within Wyoming.

SER and CEPS anticipate this graduate certificate will be of interest to current and future students at UW. In an internal survey of undergraduate and graduate students at UW, 39% of undergraduates and 24% of graduate student participants indicated they were at least "Somewhat Likely" to pursue a nuclear-focused certificate program if offered. Students interested in this graduate certificate would largely be expected to be pursuing highly technical graduate degrees in CEPS. There are considerable opportunities in the nuclear industry for chemical, civil, mechanical, and electrical engineers, chemists, computational sciences and other highly relevant disciplines. [1] SER, CEPS, and NERC will work to expand the list of available courses through discussions with relevant departments (mechanical and chemical engineering, chemistry, physics, School of Computing, etc.) and weight future faculty hires with nuclear interests. With this approach, expansion to include 6-8 electives may be achievable within a few academic years. With this number of available course options, students should be able to complete the graduate certificate requirements within 2 years. SER and CEPS will encourage all courses to be dual listed/crosslisted at the undergraduate and graduate levels so that the certificate can serve both undergraduate and graduate students at UW, although expectations and requirements will be different (as defined in UW Regulation 2-100).

Strategic Plan

How the degree will support UW's Strategic Plan, the relevant college's strategic plan, and the unit's strategic plan.

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UW students have limited access to formal coursework in nuclear science, engineering, and policy. This undoubtedly puts UW students at a disadvantage for securing positions with nuclear-focused companies and national labs. Establishing a nuclear-focused graduate certificate to supplement existing graduate degree programs would be a timely, low-cost and effective approach to better serve UW students interested in employment within the nuclear field, making UW students and graduates more competitive for careers in the nuclear energy sector in Wyoming and beyond.

This proposed certificate aligns with every aspect of the UW Mission, "We honor our heritage as the state's flagship and land-grant university by providing accessible and affordable higher education of the highest quality; rigorous scholarship; the communication and application of knowledge; economic and community development; and responsible stewardship of our cultural, historical and natural resources." This graduate certificate is being developed due to growing opportunities in the state and region, would increase research in a field important to Wyoming, and address topics already impacting Wyoming's economy and communities.

This proposed certificate also aligns with the UW Strategic Plan by providing the resources UW students need to find success in the nuclear field upon graduation (Enhancing Student Success) and by establishing a program which can directly engage with the growing nuclear sector in Wyoming (Engage with and Serve the State of Wyoming).

Learning Outcomes

The Nuclear Energy Science Graduate Certificate is intended to prepare students to engage with the nuclear energy sector through the following learning outcomes:

1. **Fundamentals of Nuclear Physics.** Students will demonstrate a strong fundamental understanding of basic physical principles relevant to nuclear energy production through the analysis of industrially relevant decay chains and fuel energy densities.
2. **Conventional and Emerging Reactor Designs**. Students will describe the basic operating principles of traditional light water reactors and emerging designs for grid-scale generation and remote deployment, highlighting the relative advantages of each with respect to safety, construction/operating costs, and fuel requirements.
3. **Economics of Nuclear Energy Production.** Students will build simple techno-economic models capable of analyzing the costs of nuclear energy projects.
4. **Public Engagement.** Students will demonstrate the ability to communicate, in simple terms, the execution of nuclear energy projects and the technical and environmental risks associated with nuclear energy generation.

Curriculum Map and Program Structure (with course descriptions)

Students in the Graduate Nuclear Energy Science Certificate program would complete the coursework in a two-year cycle. Courses will be offered on a set rotation to accommodate completion in two years. Courses can be completed in any order, which allows a student to enter the program at any time. Due to alignment with existing technical degree offerings

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already at UW, it is highly likely students would already meet any pre-requisites from courses in their primary major for required courses. If the courses become popular and start meeting capacity with full waitlists, SER and CEPS may look to expand the frequency in which the courses are offered. The list of optional coursework would accommodate students in a variety of CEPS majors.

Admission into the graduate certificate program will require a bachelor's degree or equivalent from a regionally accredited institution and at least a 3.000 cumulative GPA on undergraduate coursework (scale of 4.000). In addition, an applicant's undergraduate coursework must satisfy the prerequisites for the below core series (PHYS 1220 or equivalent).

The graduate certificate program would require students to take five 3-credit hour courses (15 total credits = 6 required credits, and 9 elective credits). These courses will need to be created upon approval of the certificate program (which is why many have *** as a course number has yet to be identified).

There will be a core two-course series that encapsulates nuclear science and reactor engineering and is required of all students:

- *ERS/ME 4***/ERS/ME 5*** Nuclear Energy Physics (NEP)* - Nuclear physics, radioactive decay, nuclear fission and fusion, neutron transport, criticality conditions, reactor kinetics.
    - *Prerequisites: PHYS 1220*
- *ERS/ME 4***/ERS/ME 5*** Nuclear Power Systems (NPS)* - Analysis of current and emerging reactor designs, plant configurations, thermal hydraulics, reactor operation, and fuel cycle management.
    - *Prerequisites: PHYS 1220*

Students would complement this core series with 3 relevant electives (9 credits) offered by a variety of departments across campus. Offerings would include (but are not limited to):

- *ERS/CHEM 4***/ERS/CHEM 5*** Nuclear Fuel Cycles* (NFC) - Overview of processes employed in nuclear fuel cycles including mining, milling, conversion, enrichment, fuel fabrication, interim storage, reprocessing, and disposal.
    - *Prerequisites: CHEM 1030*
- *ERS/ME 4***/ERS/ME 5*** Nuclear Materials* (NM) - An overview of materials commonly employed in nuclear systems and their interactions with radiation.
    - *Prerequisites: CHEM 1030*
- *ERS 5*** Law and Nuclear Technology (LNT)* - This class explores legal and policy frameworks applicable to development and deployment of nuclear technologies, including international law, state and federal regulations, and the role of nuclear in a net-zero economy.
    - *Prerequisites*: COM2 and/or Junior Standing

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- *ERS/CHEM 4***/ERS/CHEM 5*** Nuclear Forensics* - Overview of analytical techniques commonly employed in the characterization of nuclear materials.
    - *Prerequisites: CHEM 1030*
- *ERS 5*** - Advanced Energy Project Outreach and Communication*- Development of energy projects requires broad skills related to communications and outreach, especially to express complex energy concepts and projects to the public. Students will develop interdisciplinary communication skills from an energy resources perspective. Communication will include oral, digital, and written forms. Audiences for communication projects will often be live, and from a variety of backgrounds.
    - *Prerequisites: Admission to Graduate Nuclear Energy Science Certificate*

Course	SP25	FA25	SP26	FA26	SP27	FA27	SP28	FA28
ERS/ME 4/ERS/ME 5******Nuclear Energy Physics*								
ERS/ME 4/ERS/ME 5***** *Nuclear Power Systems*								
ERS/CHEM 4/ERS/CHEM 5***** *Nuclear Fuel Cycles*								
ERS/ME 4/ERS/ME 5***** *Nuclear Materials*								
ERS 4*/5***** *Law and Nuclear Technology*								
ERS/CHEM 4/ERS/CHEM 5***** *Nuclear Forensics*								
ERS 5*** *Advanced Energy Project Outreach and Communication*								

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Curriculum Map

Graduate Program Name: **Nuclear Energy Science**	Date Submitted: August 2024
Type of Map: Overview Map	

Student Learning Outcomes (SLOs)	***ERS/ME 4***/ERS/ME 5***** *Nuclear Energy Physics (NEP)*	***ERS/ME 4***/ERS/ME 5***** *Nuclear Power Systems (NPS)*	***ERS/CHEM 4***/ERS/CHEM 5***** *Nuclear Fuel Cycles* (NFC)	***ERS/ME 4***/ERS/ME 5***** *Nuclear Materials* (NM)	**ERS 4***/5***** *Law and Nuclear Technology (LNT)*	***ERS/CHEM 4***/ERS/CHEM 5***** *Nuclear Forensics*	***ERS 5***** *Advanced Energy Project Outreach and Communication*
Fundamentals of Nuclear Physics.	X					X	
Conventional and Emerging Reactor Designs.		X	X	X			
Economics of Nuclear Energy Production.		X					
Public Engagement.			X		X	X	X

Notes: If you choose to use overview map, please use "X" to indicate where a specific SLO "occurs" within a course.

Assessment Plan

1. **Fundamentals of Nuclear Physics.** Students will demonstrate a strong fundamental understanding of basic physical principles relevant to nuclear energy production through the analysis of industrially relevant decay chains and fuel energy densities.
    a. *ERS/ME 4***/ERS/ME 5*** - Nuclear Energy Physics (NEP)*
        i. Students will demonstrate a firm qualitative and quantitative understanding of nuclear physics principles through a series of mid-term and final exams.
    b. *ERS/CHEM 4***/ERS/CHEM 5*** - Nuclear Forensics*

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i. Students will describe techniques commonly employed in the analysis of nuclear material and apply fundamental nuclear physics concepts in forensic calculations in a series of mid-term exams and homework assignments.

2. **Conventional and Emerging Reactor Designs**. Students will describe the basic operating principles of traditional light water reactors and emerging designs for grid-scale generation and remote deployment, highlighting the relative advantages of each with respect to safety, construction/operating costs, and fuel requirements.
    a. *ERS/ME 4***/ERS/ME 5*** Nuclear Power Systems (NPS)*
        i. Students will demonstrate an understanding of conventional grid-scale reactor systems through a series of mid-term exams.
        ii. Students, working in small groups, will prepare and deliver a final presentation on an emerging reactor design which covers the basic principles of operation, fuel requirements, and economics.
    b. *ERS/CHEM 4***/ERS/CHEM 5*** - Nuclear Fuel Cycles* (NFC)
        i. Students will complete a series of projects focused on open/closed nuclear fuel cycles for different fuel types and enrichment levels.
    c. *ERS/ME 4***/ERS/ME 5*** - Nuclear Materials* (NM)
        i. Students will demonstrate familiarity with the physical and chemical requirements placed on materials in nuclear power systems and suitable material systems through a series of homework assignments and mid-term exams.
3. **Economics of Nuclear Energy Production.** Students will build simple techno-economic models capable of analyzing the costs of nuclear energy projects.
    a. *ERS/ME 4***/ERS/ME 5*** Nuclear Power Systems (NPS)*
        i. Students, working in small groups, will prepare and deliver a final presentation on an emerging reactor design which covers the basic principles of operation, fuel requirements, and economics.
4. **Public Engagement.** Students will demonstrate the ability to communicate, in simple terms, the execution of nuclear energy projects and the technical and environmental risks associated with nuclear energy generation.
    a. *ERS 4***/5*** Law and Nuclear Technology (LNT)*
        i. Students will research applicable laws to nuclear power in a jurisdiction of their choice
        ii. Students will write a "regulatory analysis" paper that would describe the applicable legal framework and identify strengths and weaknesses for potential projects
        iii. Students will present findings to the class in an oral presentation.
    b. *ERS/CHEM 4***/ERS/CHEM 5*** - Nuclear Forensics*
        i. Students will research technical safeguards employed to limit the unwanted proliferation of nuclear material
        ii. Students will write a paper detailing the environmental/political context and technical execution of a particular forensic analysis.
    c. *ERS/CHEM 4***/ERS/CHEM 5*** - Nuclear Fuel Cycles (NFC)*

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i. Students will prepare a technical presentation detailing the potential benefits and technical challenges associated with adopting "closed" nuclear fuel cycles.

d. *ERS 5**** - Energy Project Outreach and Communication
   i. Development of energy projects requires broad skills related to communications and outreach, especially to express complex energy concepts and projects to the public. Students will develop interdisciplinary communication skills from an energy resources perspective. Communication will include oral, digital, and written forms. Audiences for communication projects will often be live, and from a variety of backgrounds.

Degree Program Evaluation

Explain how the program will be evaluated. Will you use exit surveys of graduates, employer surveys, mid- or end-of-program feedback through focus groups or surveys, etc.? Remember that by policy, all new degree will be evaluated within 5 years of startup, so this will help you in gathering artifacts upon which that evaluation can be based.

Program evaluation is the process of systematically collecting, analyzing, and using data to review the effectiveness and efficiency of an academic program offering. These are used to: identify methods of improving the quality of higher education; provide feedback to students, faculty, and administrators; and ensure that programs, policies, curriculum, departments, and/or institutions are functioning as intended and producing desirable outcomes.

Admissions and SER will collect detailed demographic and academic data on each student who declares this graduate certificate. Analyzing these data will allow SER/CEPS/NERC to better understand the specific student populations drawn to the degree. This knowledge will inform potential curricular changes to the degree, assist in the projection of degree enrollment, and may also identify larger pockets of recruitment and targeted territory for this certificate.

SER will assess student learning outcomes through their assessment process. This will require course data from the courses listed as part of this certificate, as outlined above, and continued collaboration with CEPS. At the conclusion of the certificate, students will complete an exit survey to measure students' perception of the certificate. Student reflections will be analyzed to address degree structure, learning outcomes, and the performance of this credential.

New Resources Required

Describe new resources required, including:

- *Faculty and instructional staffing* – SER and CEPS anticipate this certificate could be well supported by one additional tenure-track faculty member, for which Academic Affairs has already committed a faculty line and also for which SER and a grant from the Nuclear Regulatory Commission will provide a competitive startup package. In addition,

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incremental costs for advising, lecturers and/or additional courses from existing UW faculty are expected to total ~$52,000/yr or less. Initial funds to support the cost will come from one-time state funding to SER. This certificate will be financially supported over the long term by an endowment pledged by the John P. Ellbogen Foundation which created the John P. Ellbogen Foundation Nuclear Energy Research Center Fund.

- *Program administration and staff support* - Administration and curriculum development for the certificate is the responsibility of SER and CEPS and guided by the co-directors of the Nuclear Energy Research Center, which is already funded by SER.
- *Technology* - Several technical courses will be supported by a new nuclear laboratory facility currently under construction, supported through funds from SER and the Department of Energy Nuclear Energy Universities Program (NEUP). No further technology is needed outside of new catalog entries.
- *Library and digital resources* - No new resources needed beyond website additions to describe the certificate program to prospective students.
- *Marketing* - This certificate would be marketed by SER and new brochures and pamphlets would be budgeted for at around $1,000. SER and CEPS will jointly market this certificate through established platforms and methods.
- *Support* - No other support is needed outside of a website, catalog entry and marketing materials.

Substantive Change Determination

Higher Learning Commission (HLC), UW's regional accrediting agency, must approve all substantive changes to UW's offering. HLC considers substantive change as the addition of a program (degree or certificate/credential level) not previously included in the institution's accreditation, usually judged to be a program that is a significant departure from normal offerings, the addition of a program with 50%+ new coursework required, or the addition or change to an existing program which will be delivered 50%+ through alternative (hybrid, online) delivery. After submitting the HLC screening form, this graduate certificate is considered a substantive change and will require review. SER will work with Academic Affairs to prepare for and execute this review.

Relationship to Other Offerings/Demand

Other nuclear energy science and engineering-focused certificate programs exist in the U.S. However, given Wyoming's unique status as a host for a first advanced reactor nuclear power system and other emerging projects, it is critical that UW creates opportunities for its students in this field. By establishing nuclear-focused certificates (both at the undergraduate level and graduate level) at UW, the university can tailor the design and delivery of material to emphasize technologies slated for deployment in Wyoming and other opportunities surrounding the nuclear supply chain. An on-campus traditional/face-to-face nuclear program at UW will help drive student interest in the field and connect students with exciting opportunities in the state and beyond.

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This graduate certificate feasibility study is being submitted concurrently with a study for a corresponding undergraduate nuclear energy science certificate. While the subject matter of these certificate programs will be similar and rely on the same selection of dual-listed/crosslisted courses, these programs will be differentiated by placing additional requirements on students pursuing the graduate certificate compared to their undergraduate counterparts. In each course, graduate students will be expected to complete additional assignments demonstrating the deeper level of understanding and rigor expected of students pursuing a degree at the masters/doctoral level and the capability to independently research topics in the field. These measurements could vary, but additional page length requirements on papers, additional minutes on oral presentations, an additional project/assignment, etc. are good examples of how 4000/5000 level courses typically differ.

Executive Summary of Demand Statistics

Nuclear power generation, nuclear fuels production, and related fields employed >66,000 workers across the U.S. in 2022 [2]. While this number is currently small in comparison to natural gas (>580,000) and petroleum (>740,000), strong growth in this field is expected in coming years due to increasing demands for carbon-free baseload power generation, the advent of advanced nuclear reactor systems with improved safety features, and small modular reactors/microreactors which can be more easily deployed. These developments have already led to a surge of activity within Wyoming, including the construction of the first 4th generation reactor in Kemmerer (TerraPower's Natrium^{TM}), strong engagement with other advanced nuclear companies such as BWXT, and improved prospects for the state's uranium mining industry. Strong growth in nuclear-related mining/extraction industries has already been observed across the U.S., with growth of 12.9% in 2021-2022 [2].

The proposed certificate in nuclear energy science at UW will be targeted towards graduate students pursuing degrees in technical disciplines relevant to nuclear energy, particularly mechanical engineering, chemical engineering, chemistry, physics, computing and geology. Projected job growth data for these fields is included in the table below, with all showing strong (>5%) projected growth through 2032 [3].

Profession	2023 Median Pay	Typical Entry-Level Education	Number of Jobs 2022	Job Outlook 2022-2032
Nuclear Engineer	$125,460	B.S.	13,800	1%
Mechanical Engineer	$99,510	B.S.	286,100	10%
Chemical Engineer	$112,100	B.S.	20,800	8%
Chemist	$87,180	B.S.	95,000	6%
Physicist	$149,530	Ph.D.	23,600	5%
Geologist	$92,580	B.S.	26,300	5%

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All data obtained from the Bureau of Labor Statistics (https://data.bls.gov)

There are currently 74 nuclear-related major/minor/certificate programs offered at 36 universities across the U.S. (see Figure 1). Of these schools, < 10 offer nuclear-focused certificate programs which could be utilized by B.S.-graduates seeking additional focused training in nuclear or M.S./Ph.D. students pursuing degrees in closely related fields. Based on the geographic distribution of these programs and the regional developments in the nuclear industry, SER and CEPS anticipate a program at UW would be attractive to current and future students. Additionally, the inclusion of coursework focused on policy, regulatory, and social matters in the certificates proposed here is relatively rare among current nuclear programs (Figure 2) and will provide students with a well-rounded view of the field, the value of which has been emphasized by UW collaborators and potential employers in the field.

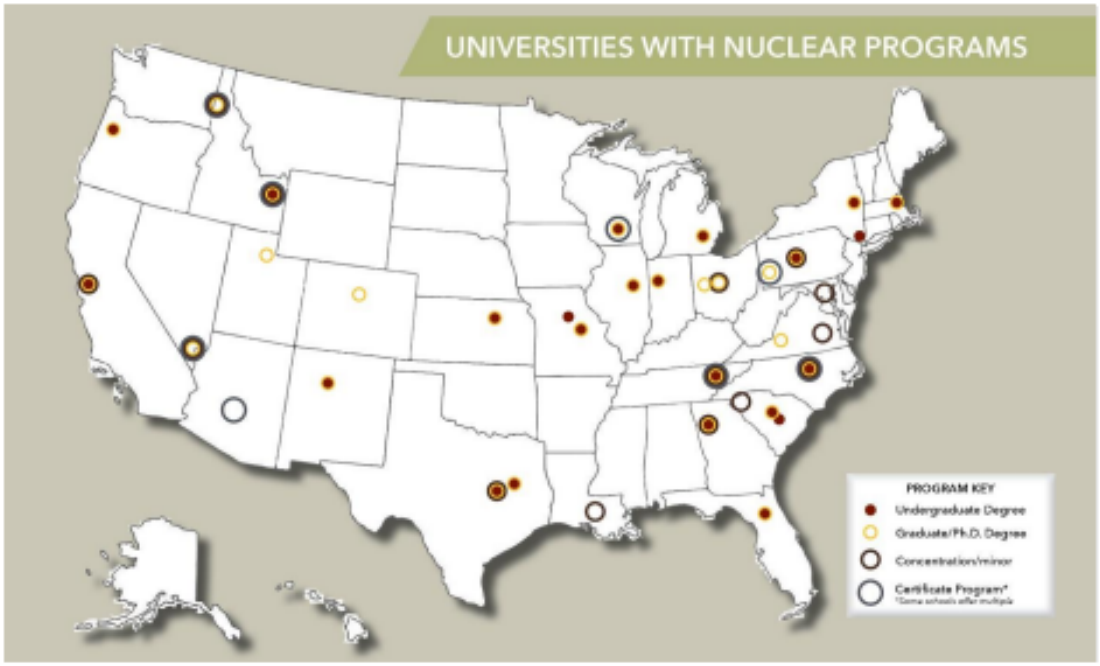

Figure 1: Geographical distribution of nuclear programs at universities across the U.S.

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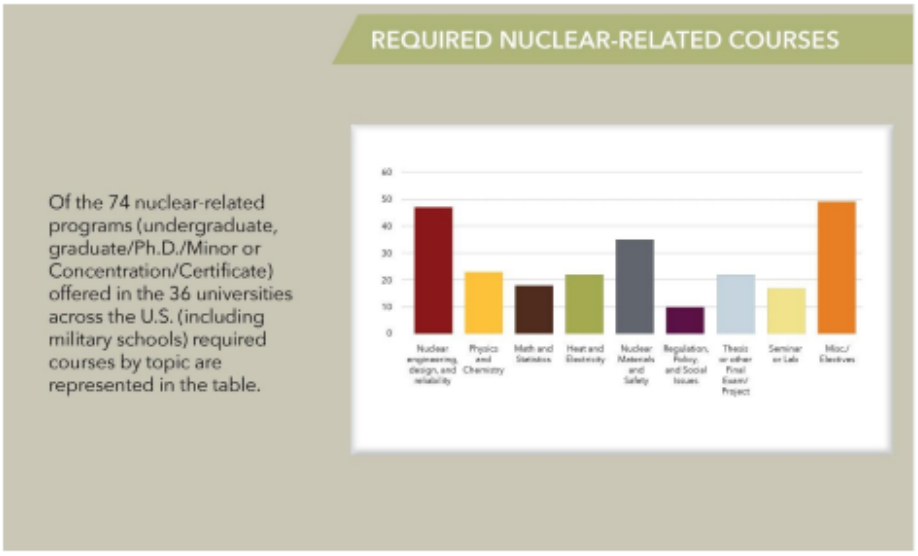

Figure 2: Course requirements in surveyed nuclear programs by topic.

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References

[1] U.S. Bureau of Labor Statistics, "May 2023 National Industry-Specific Occupational Employment and Wage Estimates - Nuclear Electric Power Generation," [Online]. Available: https://www.bls.gov/oes/2023/may/naics5_221113.htm#17-0000.

[2] Department of Energy Office of Energy Jobs, "United States Energy & Employment Report 2023," 2023.

[3] U.S. Bureau of Labor Statistics, "Occupational Outlook Handbook".

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Appendix A: LETTERS OF SUPPORT

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TerraPower

May 1, 2024

Submitted Electronically

Subject: TerraPower, LLC Letter of Support
University of Wyoming, Nuclear Energy Science Certificate Proposals

Dear UW Board of Trustees:

TerraPower, LLC (TerraPower) is pleased to provide this letter in support for the School of Energy Resources (SER) and the College of Engineering and Physical Sciences (CEPS) for their Undergraduate and Graduate Nuclear Energy Science Certificate Proposals. The certificates contain curriculum and/or research crossover with SER's area of expertise.

TerraPower considers that this interdisciplinary approach is essential in addressing the ever-evolving challenges in the fields of nuclear energy and will make UW graduates more competitive in the job market upon graduation. It is evident that this program aligns well with our mutual objectives of innovation, holistic education, and for economic benefits in Wyoming, and beyond.

TerraPower is a leading nuclear innovation company that strives to improve the world through nuclear energy and science. Since it was founded by Bill Gates and a group of like-minded visionaries, we have emerged as an incubator and developer of ideas and technologies that offer energy independence, environmental sustainability, medical advancement and other cutting-edge opportunities. In 2021, Kemmerer, Wyoming was selected as the preferred site for the Natrium™ Reactor Demonstration Project, creating a unique alignment for Wyoming, university research capacity, natural resource/mineral resource availability, advanced energy workforce pipeline and supply chain capacity.

We at TerraPower are excited about this potential degree program and what it can offer to UW students. The cross-pollination of ideas, perspectives, and expertise from SER/CEPS will undoubtedly produce graduates who are well-rounded, adaptive, and prepared to tackle the complex issues surrounding nuclear energy resources in today's rapidly changing world. Furthermore, the skills and knowledge imparted through this program will empower graduates

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to make meaningful contributions to the energy sectors, thereby addressing societal needs and global challenges.

TerraPower supports the development and implementation of this program; likewise, we plan to continue our summer intern program and invite interested students to apply. We otherwise remain interested in collaborating with other schools/colleges at UW, and these proposed Nuclear Energy Science certificates bring this to fruition.

In connection with TerraPower's commitment of support, understand that TerraPower will not, as part of its participation, disclose or provide, nor agree to disclose or provide, any intellectual property of TerraPower or any rights whatsoever in any of TerraPower's confidential or proprietary information.

We are pleased to support the Nuclear Energy Science Certificate Proposals as discussed herein.

Sincerely,

J.M. Cruse

Jonathan Cruse
Senior Director, Contracts
TerraPower, LLC

cc: Tara Neider, Senior Vice President and Project Director of Natrium
Craighton Goeppele, General Counsel

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Passed 20-0-1

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Idaho National Laboratory

April 24, 2024

UW Board of Trustees
Via Email

SUBJECT: Nuclear Energy Science New Certificates, Final Review

To Whom it May Concern:

I am writing to express my support for the School of Energy Resources (SER) and the College of Engineering and Physical Sciences (CEPS) for their Undergraduate and Graduate Nuclear Energy Science Certificate Proposals. The certificates contain curriculum and/or research crossover with SER's area of expertise.

I and my colleagues at Idaho National Lab believe that this interdisciplinary approach is needed in addressing the ever-evolving challenges in the field of nuclear energy.

We at Idaho National Lab are excited about this potential degree program and what it can offer to UW students. The cross-pollination of ideas, perspectives, and expertise from SER/CEPS will produce graduates who are well-rounded, adaptive, and prepared to tackle the complex issues surrounding nuclear energy resources in today's rapidly changing world. Furthermore, the skills and knowledge imparted through this program will empower graduates to make meaningful contributions to the energy sectors, thereby addressing societal needs and global challenges.

We are always looking for opportunities to collaborate with UW, and these proposed Nuclear Energy Science certificates will help enable this.

Please do not hesitate to reach out if you need any further information or have any questions. We are enthusiastic about the prospect of working together on this endeavor.

Sincerely,

Erin Searcy, Ph.D., Acting Deputy Laboratory Director
Science & Technology and Chief Research Officer
Idaho National Laboratory

Passed 20-0-1

Passed 20-0-1

August 1, 2024

UW Board of Trustees,
RE: Nuclear Energy Science New Certificates, Final Review

I am writing to express my enthusiastic support for the School of Energy Resources (SER) and the College of Engineering and Physical Sciences (CEPS) for their Undergraduate and Graduate Nuclear Energy Science Certificate Proposals. The certificates contain curriculum and/or research crossover with SER's area of expertise.

My colleagues and I at Western Wyoming Community College (Western) believe that this interdisciplinary approach is essential in addressing the ever-evolving challenges in the fields of nuclear energy and will make UW graduates more competitive in the job market upon graduation. It is evident that this program aligns well with our mutual objectives of innovation, holistic education, and for economic benefits in Wyoming, and beyond.

We at Western are excited about this potential degree program and what it can offer to UW students. The cross-pollination of ideas, perspectives, and expertise from SER/CEPS will undoubtedly produce graduates who are well-rounded, adaptive, and prepared to tackle the complex issues surrounding nuclear energy resources in today's rapidly changing world. Furthermore, the skills and knowledge imparted through this program will empower graduates to make meaningful contributions to the energy sectors, thereby addressing societal needs and global challenges.

Western pledges its full support for the development and implementation of this program, including working to have an articulation agreement with programs at Western into this pathway. We are always looking forward to collaborating with other schools/colleges at UW, and these proposed Nuclear Energy Science certificates bring this to fruition.

Please do not hesitate to reach out if you need any further information or have any questions. We are enthusiastic about the prospect of working together on this endeavor.

Respectfully,

Kirk D. Young

Dr. Kirk Young
President
(307) 382-1601
kyoung@westernwyoming.edu

Passed 20-0-1

Passed 20-0-1

UNIVERSITY OF WYOMING | College of Engineering and Physical Sciences

RAY S. FERTIG III, PH.D., P.E.
PROFESSOR AND HEAD
DEPT. OF MECHANICAL ENGINEERING
1000 E. UNIVERSITY AVE.
LARAMIE, WY 82071
PHONE: (307) 766-3647
EMAIL: RFERTIG@UWYO.EDU

August 5, 2024

RE: Letter of Support for Proposed Nuclear Certificate Programs

To Whom It May Concern:

I am pleased to provide a letter of support for the proposed certificate programs in nuclear energy science under development by SER and CEPS. Opportunities in the nuclear sector are particularly relevant for undergraduate and graduate students in the Department of Mechanical Engineering, and the proposed certificate programs will establish more formal coursework in this area which will greatly benefit students interested in engaging with the state's growing nuclear sector. Our department is committed to supporting the development and implementation of the proposed certificate programs by serving as the departmental home for the core series of courses in nuclear engineering as described in the feasibility studies. I believe that this initiative will not only benefit our students but also support the continued development of nuclear industries within the state.

Sincerely,

Ray S. Fertig III, P.E.
Department Head
Professor of Mechanical Engineering

Passed 20-0-1

UNIVERSITY OF WYOMING

Professor Brian Leonard
Department of Chemistry
University of Wyoming
Laramie, WY 82071
Phone: (307) 766-4137
Fax: (307)766-2807
Bleonar5@uwyo.edu

July 31, 2024

To Whom It May Concern:

I am writing to express my emphatic support for the proposed undergraduate and graduate certificate programs in nuclear energy science. A number of students and faculty in the Department of Chemistry carry out research (supported by substantial external funding from the Department of Energy) in chemical separations and materials science which have direct applications in the development of advanced nuclear fuel cycles and high-performance materials for nuclear applications. The proposed certificate programs will support these efforts by establishing relevant coursework which will better prepare students for this ongoing work at UW and help make them more competitive for jobs in the nuclear sector with national laboratories or companies developing advanced nuclear technologies. In short, the proposed certificate programs have the full support of the Department of Chemistry.

Sincerely,

Brian Leonard

Brian Leonard
Professor and Head
Department of Chemistry
University of Wyoming

Addendum B

Passed 20-0-1

Passed 20-0-1

Student Letter of Support

To whom it may concern,

I am excited to express my interest in the proposed nuclear energy graduate program at the University of Wyoming. As a mechanical engineering student, I believe that this program aligns perfectly with my academic and professional goals, offering unique opportunities to develop specialized knowledge and technical skills in an emerging and essential field. The addition of nuclear-focused coursework will significantly enhance my education, complementing my mechanical engineering background through interdisciplinary applications. From advanced thermodynamics to fluid mechanics and energy systems, the integration of nuclear concepts will deepen my understanding of power generation and sustainable energy solutions. Furthermore, this program will allow me to explore areas such as reactor design, safety analysis, and energy policy, all of which are critical for future leaders in the nuclear sector. By investing in nuclear education, the University of Wyoming will not only equip students with the expertise to succeed in the field but also strengthen the development of sustainable energy industries within the state. I look forward to the opportunity to be part of this transformative program and contribute to its success.

Best regards,

Jackson Ludlam

Student of mechanical engineering