

# TRTR Newsletter

Quarter 2 /  
2021

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## On the Cover:

Original technical drawings for fuel elements from various research reactors, including: TRIGA (top), AGN-201 (right) and MTR (bottom).



Ayman I. Hawari  
Distinguished Professor & Director  
Nuclear Reactor Program  
North Carolina State University  
ayman.hawari@ncsu.edu  
<https://www.ne.ncsu.edu/people/aihawari>

## Dear TRTR Members,

The past few months have been extremely active for our community. First, our TRTR 2021 meeting announcement was officially issued. To facilitate having an in-person meeting, we have advanced the meeting date to October 17-21, 2021 in Raleigh, North Carolina. Please visit the meeting's website at <https://projects.ncsu.edu/mckimmon/cpe/opd/trtr/>, for details about registration, abstract submission, and hotel arrangements. We look forward to having a productive meeting that contributes positively to the growth and future of our community and facilities.

In addition, a major initiative was launched in the past few months to seek the allocation of significant federal funding for existing university reactors and to promote building new reactors on

university campuses. This effort is jointly sponsored by TRTR and the Nuclear Engineering Department Heads Organization (NEDHO). It resulted in a white paper that was discussed and shared with congressional delegations and was also widely distributed to various organizations and entities. Our effort was well received, and we are hopeful that it will result in much needed support for the academic TRTR facilities well into the 21st century.

Furthermore, our community, along with the TRTR executive committee, continued to hold constructive discussions with NRC aiming in general at ensuring the safe operation and efficient utilization of our facilities. This included a public conference call with NRC in May that presented continuing progress on NUREG 1478, NPUF rule

and NUREG 1537, and TRTR's 50.59 white paper. Additionally, a public workshop was recently held with NRC that focused on the implementation of the RROAR process to address reactor operator medical examination issues. Agreement was reached to explore expanding the RROAR discussion to include other operations and operator concerns that TRTR raised by potentially holding future workshops.

As we move forward, I am more optimistic about the future of our TRTR community than I ever was. I sense a strong renewal momentum emerging and I am excited to work with all of you to promote the integration of our community and capabilities into the national agenda of nuclear science and technology.



# Letter from the Editor

Amber Johnson  
Director  
Radiation Facilities  
University of Maryland

Luke Gilde  
Reactor Manager  
Radiation Facilities  
University of Maryland

## Hello TRTR Community!

Hopefully everything is going well at your reactor. During a recent operator exam, a deficiency in our knowledge of abbreviations was noted. We thought a fun way to learn more would be with a crossword puzzle! On the backpage, we have selected 15 shortened words or terms from NUREG-0544 Collection of Abbreviations for your entertainment. Please send any fun methods that you have developed for training that we can share.

Continue to stay safe and healthy. As always, reach out with any comments or suggestions for the newsletter.

Best regards,  
Amber

# Documents Related to the February 3 Event at the NCNR

## **NIST Press Releases**

[February 3, 2021](#)

[February 5, 2021](#)

[March 2, 2021](#)

[April 15, 2021](#)

[May 6, 2021](#)

[Q&A](#)

## **NIST Reports to the NRC**

[Initial Notification of Alert](#)

February 3, 2021

[Report on Declaration of Alert](#)

February 16, 2021

[Addendum to Event Report](#)

March 4, 2021

[Notice of Safety Limit Violation](#)

March 5, 2021

[Follow Up Event Report](#)

May 7, 2021

[Follow Up Event Report](#)

May 13, 2021

## **NRC Inspection Reports**

[Interim Special Inspection Report](#)

April 14, 2021



# News

## X-energy formally begins partnership with DOE

X-energy has begun its participation in the US Department of Energy's (DOE) Advanced Reactor Demonstration Program (ARDP), receiving 80 million dollars to build a demonstration reactor to be operational in 7 years.

[Read more](#)

## Penn State Breazeale Reactor to Participate in Search for Amelia Earhart's Plane

Neutron Imaging at the Penn State Breazeale Reactor will be used to image a piece of aluminum thought to be from Amelia Earhart's Plane.

[Read more](#)

## \$100K nuclear engineering alumnus gift supports reactor licensing program | Penn State University

Don and Julie Moul donated a \$100,000 endowment that will allow undergraduate and graduate nuclear engineering students at Penn State to earn their Reactor Operator license through a yearlong training program and exam.

[Read more](#)

## Idaho National Lab Historical Whole Body Counter Moved

A 55-ton historic Whole Body Counter shield at Idaho National Lab has been moved to a new location for preservation.

[Read more](#)

## NRC Releases Report on Fission Product Release at NIST Center for Neutron Research

The NRC has released its preliminary report on the Unusual Event at the NIST Center for Neutron Research. The complete report is [ML21077A094](#).

[Read more](#)

## Nuclear Power for Clothing Factories

Entrepreneur Rickey Ruff wants to power clothing factories with small modular reactors.

[Read more](#)

## TerraPower is Building Next-Generation Nuclear Reactor

Bill Gates' TerraPower selected for the DOE's Advanced Reactor Demonstration Program (ARDP).

[Read more](#)

## Japan Will Release Radioactive Water Into The Ocean from Fukushima

Water stored at the Fukushima powerplant will be released into the ocean. All radioisotopes except for tritium have been removed from the water.

[Read more](#)

## General Atomics Wins Contract to Develop Nuclear Reactor for Space Propulsion

The Defense Advanced Research Projects Agency (DARPA) has awarded a contract to General Atomics to design a small nuclear reactor for space propulsion.

[Read more](#)

## Study Finds Effects of Radiation are Not Passed on to Next Generation

A study performed by the US National Cancer Institute has found no evidence of excess genetic mutations in the children of people exposed to radiation during the Chernobyl accident.

[Read more](#)

## Researchers at William and Mary Find Cs-137 in Honey

A geochemist at William and Mary has identified significant concentrations of Cs-137 from nuclear fallout in honey.

[Read more](#)

## Vogtle Unit 3 begins Hot Functional Testing

The new reactor under construction at the Vogtle Electric Generating Plant in Georgia has begun hot functional testing.

[Read more](#)

## Drones for Radiation Monitoring in Belgium

Radiation Monitoring Drones are being developed in Belgium for use in Radiation Emergencies.

[Read more](#)

## Man Works to Save Cats in Fukushima

Sakae Kato has worked to save over 60 cats in the Fukushima exclusion zone.

[Read more](#)

## Largest Nuclear Reactor in Europe To Begin Operations

The Olkiluoto 3 Nuclear Power Plant in Finland has been granted permission to load fuel.

[Read more](#)

## TRIGA Fuel Fabrication Facility Overhaul Completed

TRIGA International has completed a major renovation project at its fuel fabrication facility in Romans, France. This facility produces new TRIGA fuel elements for 36 TRIGA reactors around the world.

[Read more](#)

## NuScale Secures Funding for SMR Deployment from JGC Holdings Corporation

JGC Holdings Corporation will provide a \$40 million cash investment in NuScale Power and partner with Fluor on the deployment of NuScale Power Plants.

[Read more](#)

## Former Reed Reactor Director Cleared to Work Following Federal Investigation

Melinda Krahenbuhl, the former Director of the Reed Research Reactor, has been allowed to return to NRC related activities after a year-long ban.

[Read more](#)

## Japan Allows Restart of More Reactors

The Kansai Electric Power reactors -- units 1 and 2 at the Takahama nuclear power plant and unit 3 at the utility's Mihama plant have been permitted to restart for the first time since the Fukushima disaster. These plants are the first older than 40 years to be allowed to restart.

[Read more](#)

## Hanford Tank Leaking

A storage tank at the Hanford Site is believed to be leaking about 3.5 gallons per day.

[Read more](#)



## Neutron Diffraction Used in Developing Gas Turbine Blades

Neutron Diffraction at the Technical University of Munich is being used to evaluate the stresses in 3D printed parts being developed for gas turbines.

[Read more](#)

## Air Force Atomic “Robot”

The US Air Force built a “robot” to work on nuclear powered aircraft.

[Read more](#)

## Book Review: ‘The Dark Horse: Nuclear Power and Climate Change’

Rauli Partanen and Janne Korhonen have a new book on Climate Change and nuclear power.

[Read more](#)

## Increased Neutron Count Rates at Chernobyl

Increasing Neutron Count Rates have been observed in some inaccessible portions of the remains of the Chernobyl reactor sparking concerns of a return to criticality.

[Read more](#)

## Muons Used to Image Pyramids

Researchers are using muon tomography to explore the pyramids of Egypt and have discovered several previously unknown rooms.

[Read more](#)

## African American Scientists of the Manhattan Project

12 Black chemists and physicists worked as primary researchers in the Manhattan Project.

[Read more](#)

## New Type of Imaging Developed to Locate Nuclear Materials

A new technique using combined detection of neutrons and gamma rays offers faster location of radioactive materials.

[Read more](#)

## Vogtle Nuclear Plant Further Delayed

Delays in testing at the new units at Vogtle Nuclear Power Plant have made their startup before 2022 unlikely.

[Read more](#)

# Events

**June 21-25, 2021**

Prague, Czech Republic

International Conference on  
Advancements in Nuclear  
Instrumentation Measurement  
Methods and their Applications

[Website](#)

**June 21-25, 2021**

Vienna, Austria

Training Workshop on  
Integrated Management  
Systems for Research Reactors

[Website](#)

**August 2-6, 2021**

Vienna, Austria

Technical Meeting on Good  
Practices for the Operation  
and Maintenance of Research  
Reactors

[Website](#)

**August 23-27, 2021**

Vienna, Austria

Technical Meeting on Upgrades  
to Digital Instrumentation and  
Control Systems for Research  
Reactors

[Website](#)

**September 8-10, 2021**

London, UK

World Nuclear Association  
Symposium

[Website](#)

**September 26-30, 2021**

Helsinki, Finland

The European Research Reactor  
Conference

[Website](#)

**October 4-8, 2021**

Vienna, Austria

Technical Meeting on Risk  
Informed In-Service Inspection  
and Decision Making for  
Research Reactors  
Technical Meeting on Risk Informed In-  
Service Inspection and Decision  
Making for Research Reactors

[Website](#)

**October 17-21, 2021**

Raleigh, NC

TRTR 2021 Annual Conference

[Website](#)

**October 31-November 4, 2021**

Washington D.C.

American Nuclear Society  
Winter Meeting

[Website](#)

**November 30 - December 2,  
2021**

Paris, France

World Nuclear Expo

[Website](#)

**June 12-16, 2022**

Anaheim, CA

American Nuclear Society  
Annual Meeting

[Website](#)

**September 25-29, 2022**

Seattle, WA

International Conference on  
Radiation Shielding and  
Topical Meeting of the  
Radiation Protection and  
Shielding Division

[Website](#)

# Inspections



**University of Utah**

**October 13-23, 2020**

The inspection included a review of organization and staffing, procedures, health physics, design changes, committees, audits and reviews, and transportation of radioactive material. One Level IV violation was identified for startups performed without the Reactor Supervisor present. The complete inspection report is [ML20304A216](#).



**United States Geological Survey**

**November 16-19, 2020.**

The inspection included a review of organization and staffing, operations logs and records, procedures, requalification training, surveillance and limiting conditions for operation (LCOs), design changes, committees, audits and reviews, emergency planning, maintenance logs and records, and fuel handling logs and records. No violations were identified. The complete inspection report is [ML20335A181](#).

**January 21 – 23, 2021**

The inspection included a review of organization and staffing, procedures, health physics, material control and accounting, and transportation activities during the receipt of fuel from the VTT Technical Research Centre of Finland Ltd. No violations were identified. The complete inspection report is [ML21042B227](#).



**Washington State University**

**October 13-23, 2020**

The inspection included a review of security compliance. No violations were identified. The inspection notification is [ML20339A674](#).



## University of Massachusetts, Lowell

**October 20 - 22, 2020**

The inspection included a review of procedures, experiments, health physics, design changes, committees, audits and reviews, and transportation of radioactive material. No violations were identified. The complete inspection report is [ML20317A194](#).



## University of Missouri, Columbia

**November 2-6, 2020**

The inspection included a review of operator licenses, requalification, and medical examinations, experiments, organization and operations and maintenance activities, review and audit and design change functions,

procedures, fuel movement, surveillance, emergency preparedness, and event follow-up. One Level IV violation was identified for failures of a control rod drive mechanism; these are being treated as non-cited violations. The complete inspection report is [ML20322A365](#).

**February 22-25, 2021**

The inspection included a review of security compliance. No violations were identified. The notification of inspection is [ML21062A227](#).

**March 29 – April 1, 2021**

The inspection included a review of effluent and environmental monitoring, review and audit and design change functions, procedures, emergency preparedness, radiation protection, and transportation activities. No violations were identified. The complete inspection report is [ML21099A018](#).



## National Institute of Standards and Technology

**February 9, 2021**

The NRC conducted a special inspection of the circumstances surrounding the Safety Limit violation at the NIST Center for Neutron Research. The complete inspection report is [ML21077A094](#).



## North Carolina State University

**August 31-September 2, 2020**

The inspection included a review of security compliance. No violations were identified. The notification of inspection is [ML20252A236](#).



## Oregon State University

**May 17-20, 2021**

The inspection included a review of organization and staffing, operations logs and records, procedures, health physics, design changes, committees, audits and reviews, transportation records. No violations were identified. The complete inspection report is [ML21153A082](#).



## University of Wisconsin

**May 10 - 13, 2021**

The inspection included a review of organization and staffing, operations logs and records, procedures, requalification training, surveillance and limiting conditions for operation (LCOs), design changes, committees, audits and reviews, emergency planning, maintenance logs and records, and fuel handling logs and records. No violations were identified. The complete inspection report is [ML21146A158](#).



## University of Texas - Austin

**June 22-24, 2020**

The inspection included a review of security compliance. Two Severity Level IV Non-Cited Violations were identified. The inspection notification is [ML20309A811](#).



## Rhode Island Nuclear Science Center

**April 26-29, 2021**

The inspection included a review of effluent and environmental monitoring, organization and operations and maintenance activities, review and audit and design change functions, emergency preparedness, radiation protection, and transportation activities. No violations were identified. The complete inspection report is [ML21126A112](#).



## General Electric – Hitachi Vallecitos Nuclear Center

**March 8-11, 2021**

The inspection included a review of organization and staffing, operations logs and records, procedures, requalification training, surveillance and limiting conditions for operation (LCO), experiments, health physics, design changes, committees, audits and reviews, emergency planning, maintenance logs and records, fuel handling logs and records, and transportation activities. One Level IV non-cited violation was identified for the reactor key being left unattended in the console. The complete inspection report is [ML21118B022](#).

# RROAR

# Workshop

June 15th, 2021

In response to the Federal Register notice ([85 FR 6103](#)), TRTR included comments in an NEI letter ([ML20128J340](#)) proposing alternate means for operator medical qualification. The NRC response is addressed in this SECY paper [ML21016A000](#) and enclosure [ML21012A439](#). Our item was screened out of the RROAR process as 10 CFR 55.33(a) does not have a record keeping or reporting requirement. This workshop provided alternate means to address operator medical qualification by allowing the TRTR community to present common issues related to medical qualification and training.

## Operator Medical Issues

Medical device regulations applied inconsistently.

Judgement of level 2 regarding operator health certification is often bypassed.

Medical Form 396 submittal times are inconsistent.

## Additional Issues Raised Concerning Training

One year residency at the facility not found in regulations.

Senior Reactor Operator- Instant application scrutiny on experience and educational supplementation.

Explicit justification for how past experience counts as relevant nuclear experience.

Required information for license renewals and timeliness of renewals/new licenses.

## Meeting Outcomes

Investigate a possible path forward to endorse ANSI/ANS 15.4 Selection and Training of Personnel.

There will be more meetings to circle back on the issues raised today.

## Items of Interest

A physician's assistant or nurse practitioner can conduct the medical exam but Form 396 must be certified by a licensed doctor.

If you have medical conditions

other than glasses or hearing aids, submit Form 396 prior to the 14 days listed in NUREG 1478. The NRC Medical Reviewing Official has 10 working days to complete their review.

Form 396 is confusing to complete, especially for facilities who do not schedule frequent exams.

Hotly anticipated revision to NUREG 1478 should clarify many training issues.

*Please send any comments, concerns to myself or other members of the executive committee. We want to make sure all issues are addressed!*

# Special Reports

[ML21134A245:](#)

## **MSTR Requal Violation**

Requalification Plan requires each licensed operator to acknowledge in writing a change in any operating procedure prior to conducting operations after the change has been implemented. Corrective action is a formal SOP regarding procedure revisions that will include provisions for better tracking.

[ML21132A251:](#)

## **MITR Staffing Violation**

TS 7.1.3(1) requires that there shall be at least one SRO and another licensed operator present on site when the reactor is not shut down. For a period of about 1 hour, there was only an SRO and trainee present in the control room. Corrective action is a visible shift coverage and compliance notice board.

[ML21078A500:](#)

## **MURR Dose Rate Limits in Public Areas Exceeded**

Dose rates in excess of levels specified in § 20.1301(a)(2) were found when vials of Mo-99/Tc-99m were moved inside of the hot cell to an attached shielded glove box. Corrective actions consist of procedural changes and training.

[ML21069A292:](#)

## **GEH-NTR Requal Violation**

The due dates for operators biennial written and annual operating tests were exceeded. Corrective actions is a calendar-based tracking system to ensure completion of all requalification plan requirements.



[ML21134A057:](#)

May 25, 2021

3:00-4:00pm EST

# NRC Quarterly Call Summary

**Josh Borromeo** is the new Chief of the NPUF licensing branch.

**NUREG 1478 rev 3 schedule** - Expect draft in August 2021  
Licensees should receive results of operator exams within 90 days  
of the start of the exam.

**RROAR workshop** on June 15 in response to our Operator  
Medical Licensing Examination submission from May 2020.

[ML20128J340](#)

**NUREG 1537 revision** is unable to go out for public comment until  
the NPUF rule is finalized with the Commission.

[ML18031A001](#)

Progress continues on the **50.59 white paper**. Goal is  
endorsement by the end of the fiscal year.

# Know More Nukes

## North Carolina State University

**Anna Isom**

Student Reactor Operator  
Department of Nuclear Engineering

**Top: Anna Isom (right) instructing reactor operator trainee May Wells (left) at the reactor console.**

**Next page: PULSTAR reactor core**

### **What year did your reactor first go critical?**

NC State University originally had the first academic research reactor in the world, achieving its first criticality in 1953. Our first reactor, R-1, was a liquid homogeneous type reactor that was shut down in 1955. We now operate the 1 MW PULSTAR reactor, the fifth reactor located at NC State, which first went critical on September 9th, 1972.

### **What is the reactor license number? Power level?**

Our license is R-120, with a power level of 1 MW thermal.

## **What is your position at the reactor? How long have you held that position?**

Student Reactor Operator. I obtained my RO license in May of 2019.

## **Have any major changes/modifications, such as conversion, power upgrade, etc..., been done?**

One of the long-term changes we have been working on is upgrading our reactor license to 2MW. In 2013 we initiated a process to upgrade the reactor power level. A DOE infrastructure grant provided funding to upgrade the reactor

cooling system from 1 MW to 2 MW. In 2016 we received NRC approval to operate with a mixed enrichment core, using both 4% and 6% enriched PULSTAR fuel assemblies, extending fuel reserves.

In 2017, a license renewal and power upgrade application for operation at 2MW was submitted to the NRC and is currently under review.

## **What is a unique feature of your reactor?**

We have multiple experimental facilities that are the only of their kind in the United States! An Intense Slow Positron Beam is located within one of the beam ports. We are currently developing a Fission Gas Release Loop that will provide

further insight into the diffusion coefficient for fission product gas release from different reactor fuel types, both liquid and solid.

## **What is a fun fact about your reactor?**

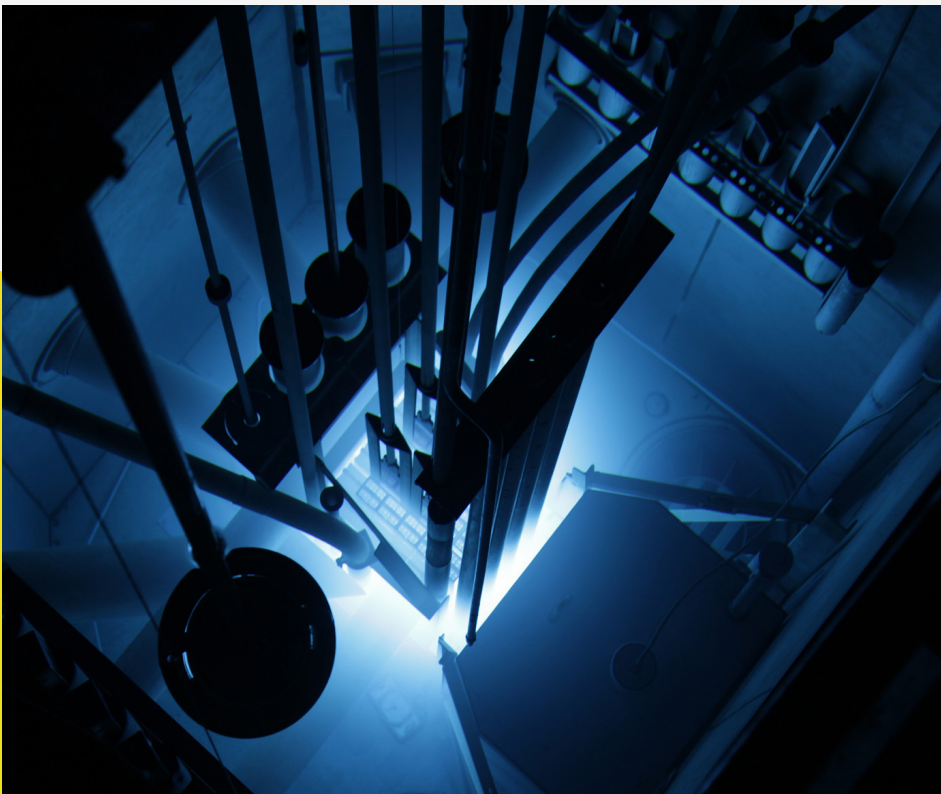
Our name "PULSTAR" was initially an acronym for PULSed Training Assembled Reactor. We were originally a pulsing reactor, but by the late 1980's it wasn't being used to support any of our experiments. Given the additional surveillance burden required to support pulsing, we removed pulsing capabilities.

## **What is the biggest challenge facing your reactor?**

Providing ongoing maintenance to ageing components. It can be difficult to obtain exact replacements for older technology.

## **What is the most unusual request someone has had to use your reactor?**

We assisted in a criminal investigation by irradiating hair and fingernail samples to determine whether or not someone had been poisoned. By irradiating the samples, we were able to determine that the samples showed signs of arsenic poisoning. Analysis showed the amount of arsenic and the time frame over which





Anna Isom at the console.

it was consumed, which was provided as evidence during the trial.

### **What drew you to your current position?**

The PULSTAR licensing program includes an NCSU course in the fall, followed by reactor operator training in the spring. As a freshman, I received some great advice from an upperclassman to take the fall course (NE235), regardless of whether or not I wanted to continue with training, because it outlines the rest of the nuclear engineering courses well. It was my favorite class that semester, and I was selected to continue in the training program.

### **What has been your favorite project?**

Assisting with the training of new student operators has been so rewarding, and I've had the opportunity to hone my public speaking and organizational skills.

### **Before working at your reactor, what was the most unusual or interesting job you've ever had?**

In my first year at NC State, I worked as an usher for university theatre. I got to sit in on events like the spring musical, dance competitions, and a small traveling circus!

### **What do you find the most challenging at your reactor?**

As a student, it can sometimes be difficult to balance my classes and work.

### **What advice would you give to new reactor operators?**

Be willing to accept feedback and own your mistakes. One of the most important things in any

nuclear environment is integrity. Admitting fault and accepting coaching when it is given is essential to improving yourself and the team, and crucial to maintaining a safe environment.

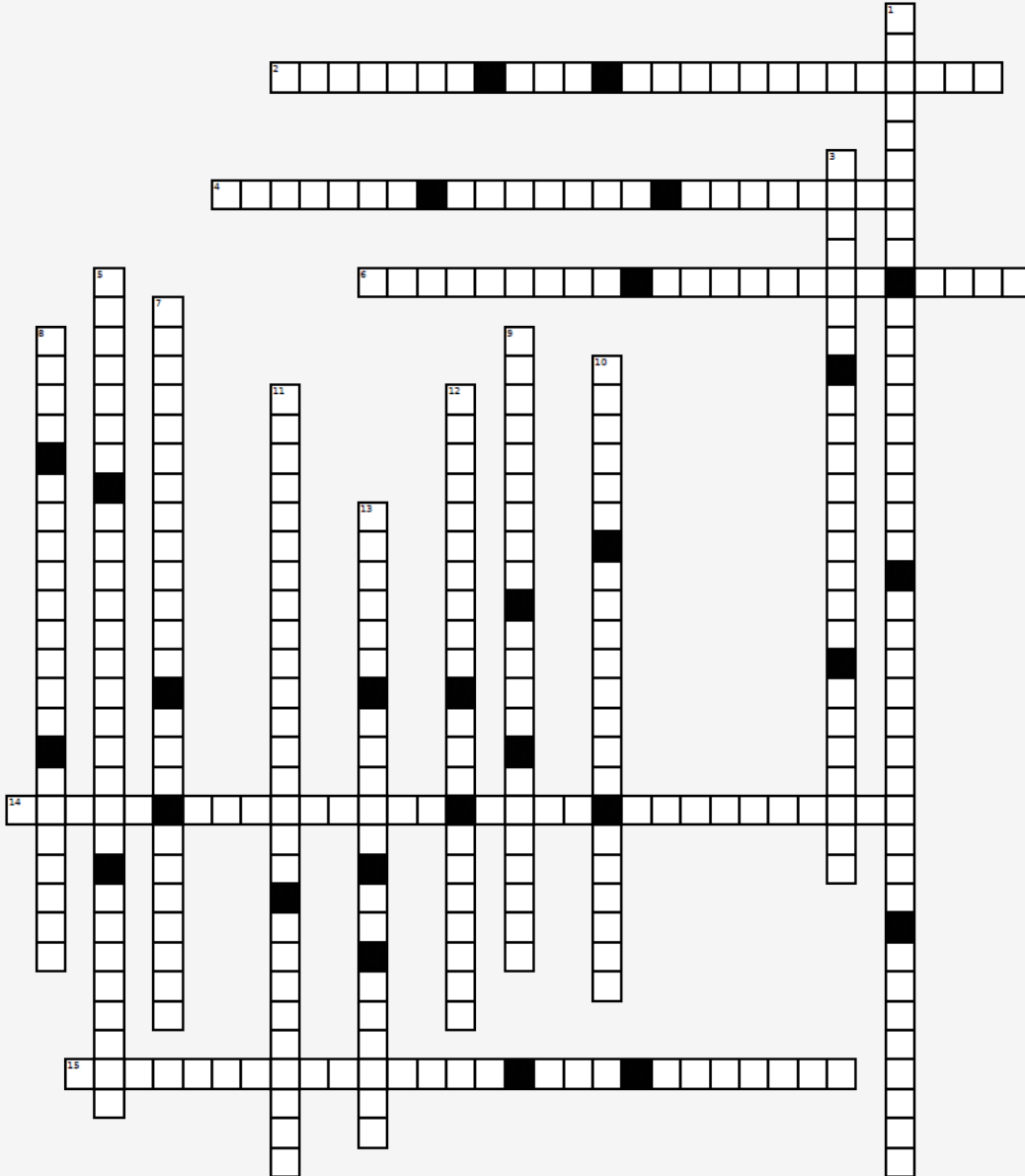
### **What are three career lessons you've learned thus far?**

First and foremost, communication is the glue that holds a team together - without communication, there is no team. Second, public speaking is a critical skill in every environment. It may not come naturally to everyone, but it's important to actively search for opportunities to work on it. Finally, every team member should always feel comfortable bringing up potential safety concerns, especially in a nuclear environment.

### **Anything else?**

Participating in reactor operations training was one of the best decisions I have made in my academic career. The team I am fortunate to work with prioritizes research, education, and training. Being a reactor operator has allowed me to learn about many real-world applications to the classroom knowledge I obtain in my courses.

# Reactor Acronyms



## Down

- 1 NORM
- 3 LAR
- 5 MHA
- 7 UIC
- 8 ARM
- 9 RAM
- 10 SAR
- 11 TLD
- 12 CAM
- 13 ALI

## Across

- 2 DAC
- 4 SNM
- 6 EPZ
- 14 TEDE
- 15 I&C