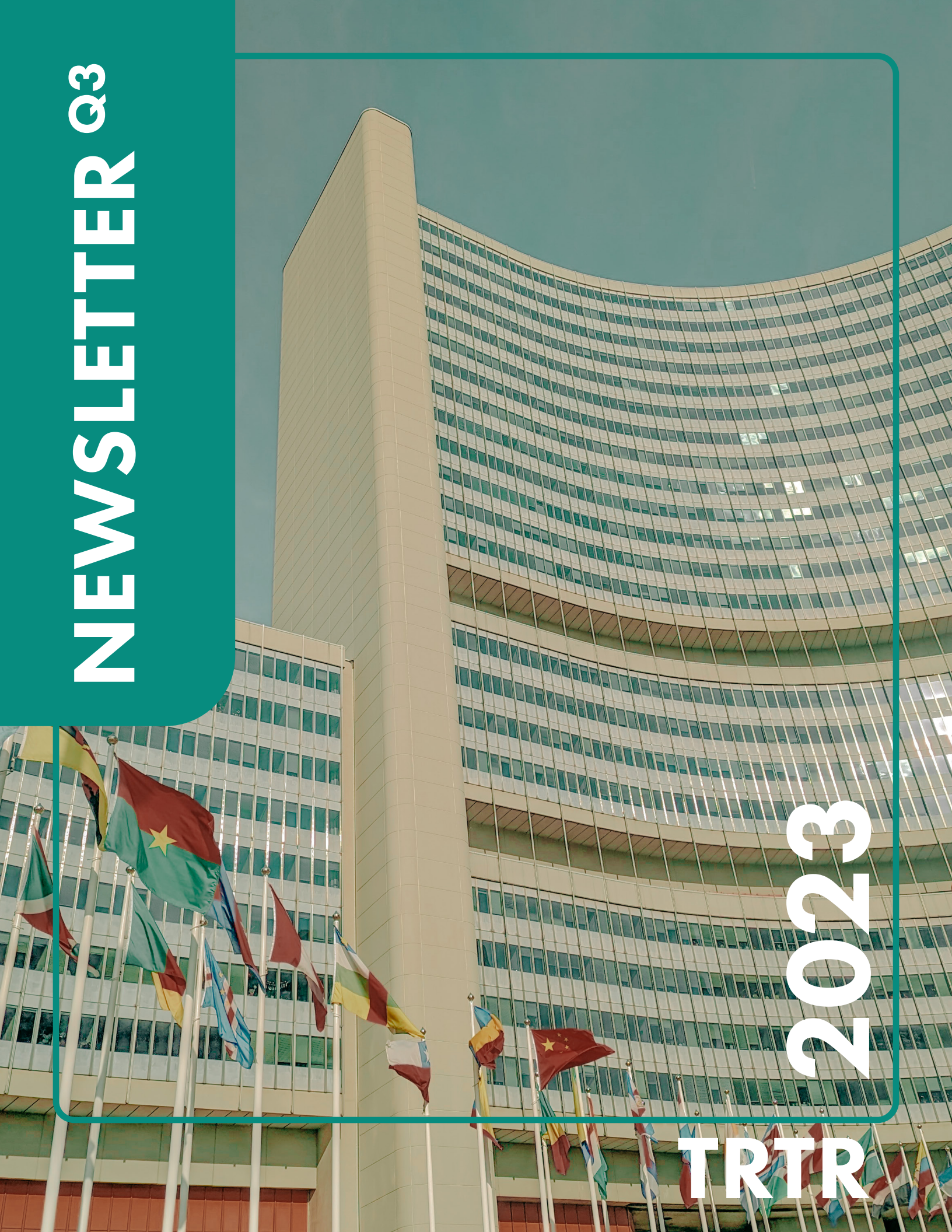


NEWSLETTER Q3

2023

TRTR



LETTER FROM THE CHAIR

Dear TRTR Members,

It is almost time for our joint TRTR/IGORR meeting at the University of Maryland in just a matter of days. Meeting host Amber Johnson has put a great program together, and crab cakes. That brings my time as TRTR Chair to a close as Steve Reese from Oregon State prepares to take the reins of the organization until our next meeting at Sandia National Laboratory in 2024. If you have not been an active participant in TRTR activities in the past, now is always a good time to get involved. That is how it happened for me in 2005 when I was a fairly green Facility Director at Purdue. The very same Steve Reese stood up in front of the annual meeting and asked for people to get involved. I did get involved and have continued to be involved in one way or another ever since. The continued successes of this community in safe and effective operations are important to me, as they should be to all of us, but it must be a continuous collaborative effort on all our parts. This is particularly true as we begin to bring new members into our organization, such as Atomic Alchemy, Kairos, SHINE, Abilene Christian, UIUC, and others. There is much we can share with each other, including licensing and operational experience, such that our new members can hit the ground running as they work through the processes of getting their reactors built and online.

Amber has again assembled another fantastic Quarterly Newsletter. This edition has some valuable links to guidance on Corrective Action Programs and operating Subcritical Reactors. The news digest has some highlights, like the permission to restart NIST's reactor at the NCNR, and out in the power world Vogtle-3 reaching 100% power and preparing to generate electricity. The Newsletter is a short read but well worth your time. You can access many of the recent Newsletters at <https://www.trtr.org/trtr-newsletters/>.

Some other activities that the Community has been involved with include a guidance document for 50.59 reviews of Digital Upgrades at research and test reactor facilities, which has been spearheaded by Steve Reese from Oregon State, as well as continued work on some of the 15.x ANSI/ANS standards. These are activities that I would invite all of you to contribute your time and effort to. They are worth it for all of us, existing and new facilities alike. If you are interested in participating in the ANSI/ANS working groups, please contact Tom Newton at NIST.

Chair's Message Continued on page 4



Jere Jenkins
Texas A&M Engineering Experiment Station
TRTR Chair

LETTER FROM THE EDITOR

Greetings TRTR Community!

We are looking forward to seeing everyone in College Park later this month for our annual meeting. We look forward to learning and sharing best practices across the fleet. A detailed agenda is available in the conference app.

An interesting article recently shared with me looks at [improving lab safety culture by addressing diversity, equity, inclusion and respect](#). This uses the RAMP risk assessment model to address DEIR principles. We have previously used this method to address chemical and physical hazards.

Finally, the NIST restart was recently authorized! Please review the corrective actions they identified and see if any are applicable to your facility.

Best regards,

Amber



Amber Johnson
University of Maryland
Editor



Luke Gilde
University of Maryland
Content Editor

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Edition

2023

July 23-26, 2023

**U.S. Women in Nuclear
Conference**

Scottsdale, AZ, United States
[Website](#)

July 24 - August 4, 2023

**Modeling, Experimentation
and Validation (MeV)
Summer School**

Idaho Falls, ID, United States
[Website](#)

November 12-15, 2023

**ANS Winter Meeting and
Technology Expo**

Washington DC, United States
[Website](#)

November 27-December 1, 2023

**International Conference
on Research Reactors:
Achievements, Experience
and the Way to a
Sustainable Future**

Dead Sea, Jordan
[Website](#)

April 21-24, 2024

**International Conference
on Physics of Reactors**

San Francisco, CA, United States
[Website](#)

Chair's Message Continued from page 2

I'd like to thank, again, the TRTR Executive Committee (EC) for all their hard work this past year, especially Hilary Lane from the Nuclear Energy Institute. Hilary has played an important role in the EC keeping us informed on new initiatives from the NRC, and gives me a kickstart from time to time when I am distracted by the same things we are all working on every week, namely working to keep our facilities operating safely and effectively.

I hope that the summer season is kicking off for all of you in spectacular fashion, and I look forward to seeing you all in College Park.



NRC Inspections

Dow Chemical TRIGA Research Reactor

October 3 - 5, 2022
[ML23003A810](#)

The inspection included a review of security compliance. No violations were identified.



University of Missouri-Columbia Research Reactor

October 24 - 26, 2022
[ML23024A277](#)

The inspection included a review of security compliance. Two severity level IV violations were identified; 1 is being treated as a non-cited violation.

October 24-27, 2022
[ML23025A397](#)

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, and abnormal occurrence follow-up. Two severity level IV violations were identified for equipment failures during reactor operations. The violations are not being cited.



UPCOMING EVENTS

Inspections Continued

University of California - Irvine Nuclear Reactor Facility

December 12 - 15, 2022

[ML23047A348](#)

The inspection included a review of security compliance. No violations were identified.



U.S. Geological Survey TRIGA Reactor Facility

January 10-12, 2023

[ML23054A207](#)

The inspection included a review of organization and staffing, operations logs and records, requalification training, surveillance and limiting conditions for operation (LCOs), emergency planning, maintenance logs and records, and fuel handling logs and records. No violations were identified.



University of California-Davis/McClellan Nuclear Research Center

January 9-12, 2023

[ML23048A311](#)

The inspection included a review of organization and staffing, procedures, experiments, health physics, design changes, committees, audits and reviews, emergency planning, and transportation activities. No violations were identified.



Rhode Island Nuclear Science Center

February 21-24, 2023

[ML23081A530](#)

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.



Ohio State University Research Reactor

February 6-10, 2023

[ML23055A277](#)

The inspection included a review of procedures, experiments, health physics, design changes, committees, audits and reviews, and transportation activities. No violations were identified.

February 6-10, 2023

[ML23060A083](#)

The inspection included a review of security compliance. No violations were identified.



Purdue University Reactor Facility

March 6 - 9, 2023

[ML23088A226](#)

The inspection included a review of organization and staffing, operations logs and records, procedures, requalification training, surveillance and limiting conditions for operation, experiments, health physics, design changes, committees, audits and reviews, emergency planning, maintenance logs and records, fuel handling logs and records, and transportation activities.

A Severity Level IV violation was identified for a portable survey meter being used in place of a fixed radiation area monitor for longer than the Tech Spec allowed interval.



University of Texas - Austin Nuclear Engineering Teaching Laboratory

The NRC issued a Severity Level III violation ([ML23129A243](#)) for operating the reactor with aluminum clad fuel elements in the core as described in Event Number [56198](#). The NRC elected not to impose a fine for due to the corrective actions taken and the lack of prior significant violations. These corrective actions included revising procedures for fuel element inspections, handling, and tracking, evaluating other procedures to determine if other Tech Spec violations may occur, and visually identifying fuel storage racks containing elements not licensed for use in the core.



News

MARVEL Test Facility Installed

A full-scale electrically heated prototype of the Department of Energy's 100 kW MARVEL reactor is now installed at Creative Engineers Inc. in New Freedom PA. The prototype is expected to be operational in the next few months, and operate until the actual MARVEL Reactor starts up in 2024.

Kazakhstan Research Reactor Converted to LEU

The IVG.1M research reactor at Kazakhstan's National Nuclear Centre has converted to use low enriched uranium fuel.

Vogtle Reactor Reaches Full Power

The new Vogtle Unit 3 Reactor reached 100% power for the first time, and should begin supplying power in June. Unit 4 is expected to begin loading fuel in July.

Dutch–Norwegian Cooperation on Research Reactors

Physics Today article exploring the Dutch–Norwegian collaboration that led to the first nuclear reactor built by nonmajor powers in 1951: the Joint Establishment Experimental Pile (JEEP).

Former Nuclear Research Facility Sold for \$7.7 million

The site of the former Industrial Reactor Laboratories reactor in Plainsboro, New Jersey was sold for \$7.7 million. The reactor license was terminated in 1977, and the site has been used as a pharmaceutical laboratory since.

ANSTO Celebrates 70th Anniversary

The Australian Nuclear Science and Technology Organisation (ANSTO) is celebrating its 70th anniversary in 2023.

MURR Seeks Designs for New Reactor

University of Missouri has announced it will seek proposals for a new and larger research reactor to produce radioisotopes. Additionally, a \$20 million investment to upgrade the current reactor was announced along with a \$24 million investment from the U.S. Department of Energy (DOE) in a campus Radioisotope Science Center.

TRIGA Fuel Production Resumes

The DOE received the first of 668 TRIGA fuel elements ordered from TRIGA international to be delivered over the next 9 years.

Funding to Expand McMaster Nuclear Reactor

The Ontario government announced \$6.8 million in funding to expand the capabilities of the McMaster Nuclear Reactor. Overall, McMaster is investing \$25 million to increase operations to 24 hours a day, 5 days a week.

Virginia Tech Research Reactor

From 1960 until 1985 Virginia Tech operated an Argonaut Reactor.

Research Reactor in Prague

The VR-1 reactor in the Czech Republic has been in operation since 1992 and is operated by Faculty of Nuclear and Physical Engineering of the Czech Technical University.

News

IAEA Completes Integrated Safety Assessment of Research Reactors at Belgian Research Reactor

The IAEA completed a Integrated Safety Assessment of Research Reactors (INSARR) mission at the Belgian BR2 research reactor.

BR2 Reactor Tests High-performance LEU Fuel

Three low-enriched uranium (LEU) fuel test assemblies have successfully been tested in Belgium's BR2 research reactor. The Belgian Nuclear Research Centre (SCK-CEN) plans to fully convert the reactor from using highly-enriched uranium (HEU) in 2026.

RA-10 Reactor Nears Completion

The 30 MW RA-10 Multipurpose Argentine Nuclear Reactor at the Ezeiza Atomic Center near Buenos Aires is expected to be completed by 2025. It will be the most powerful research reactor in the Southern Hemisphere.

Mo-99 Production Reaches Milestone

All major global molybdenum-99 production facilities are now using low-enriched uranium targets following the completion of work to convert Belgium's National Institute of Radioelements production facility.

Poland to Build Micro Nuclear Reactor for Research Purposes

West Pomeranian University of Technology signed an agreement with Ultra Safe Nuclear Corporation to jointly prepare a plan for the construction, operation and maintenance of a Micro Modular Reactor to the power infrastructure of the Azoty Police Group.

Demolition of LITR Begins

The Low Intensity Test Reactor, the first reactor at which Cherenkov Radiation was photographed, is to be demolished by the end of the year.

Pallas Reactor Awarded Construction License

The Authority for Nuclear Safety and Radiation Protection granted a license for construction of the Pallas reactor, which will replace the aging High-Flux Reactor at Petten.

Cooper Biggar on Reactor Operations at McMaster University

Cooper Biggar, a licensed Reactor Operator at the McMaster Nuclear Reactor was interviewed by Matt Moran.

Belarus and Russia to Build Research Reactor

Belarus and Russia are negotiating to build a Sosny Joint Institute for Energy & Nuclear Research near Minsk.

FRM-II to Transition to LEU

Framatome has completed the development of the main component monolithic molybdenum-uranium fuel for the FRM-II research reactor in Germany.

Operators are Working to Repair the KIPT Neutron Source

Repairs are underway at the Kharkiv Institute of Physics and Technology Neutron Source in Ukraine. The facility was damaged by missile attacks, and a lack of electricity still hampers work.

ACU Reactor Building Nears Completion

The Gayle and Max Dillard Science and Engineering Research Center (SERC) building at Abilene Christian University is expected to be completed by June 2023. The building is expected to house a new molten salt nuclear research reactor.

DOE Plans HEU Fueled Reactor

The DOE controversially announced that the Molten Chloride Reactor Experiment will be fueled with High Enriched Uranium.

Reportable Occurrences

Lost Shipment

MURR made a report ([ML22290A004](#)) of radioactive material lost in shipping. A shipment of 105 mCi of Lu-177 was made on 9/8/2022 and reported lost by the shipper on 9/21/2022. MURR reported the loss to the NRC on 10/12/2022 pursuant to [10 CFR 20.2201\(a\)\(ii\)](#).

Area Radiation Monitor Inoperable

On 4/25/2023, Texas A&M [reported](#) that a required Area Radiation Monitor display in the Emergency Support Center was inoperable, violating Technical Specification 3.5.1.

Control Blades at Incorrect Heights

During a reactor startup on 5/23/2024, MURR [reported](#) a single control blade was 1.4 inches below the other 3 while the reactor was operating above 100 kW in violation of Technical Specification 3.2.b.

NRC-TRTR Quarterly Call

On May 23, 2023 the NRC hosted the quarterly NRC-TRTR meeting on Microsoft Teams. Josh Borremeo discussed the upcoming information notice regarding the NRC's findings of human performance, safety culture, and procedural adherence issues at some research reactors. The information notice is not intended to be punitive, but to provide relevant information on

the NRC's findings to the research reactor community. The NRC is also reviewing a 50.59 guidance for research reactor Digital I&C upgrades similar to the general guidance released last year; a public meeting on the NRC's review will be held on [May 31, 2023](#).

The addition of the NRC's activities regarding Research and Test Reactors to their Agency Action Review Meeting where inspection activities are presented to the Directors and Commissioners was also discussed. The NPUF rule remains under review by the Commissioners as well. Jonathan Greives was introduced as the acting DANU Deputy Director while Caroline Carusone is on rotation.

Paulette Torres provided an update on the transition to the Govdelivery Subscription Service where you can subscribe to receive notifications of the release of publicly available documents. Travis Tate also requested that facilities notify the NRC of their need for exams in FY2024, even if they will not need any exams; a tentative schedule should be prepared in June or July. Travis also highlighted the improvements to the processing times for operator licenses and noted that a draft of NUREG 1478 should be released for comments soon.

The NRC is tentatively scheduling the next quarterly call for August 8th.

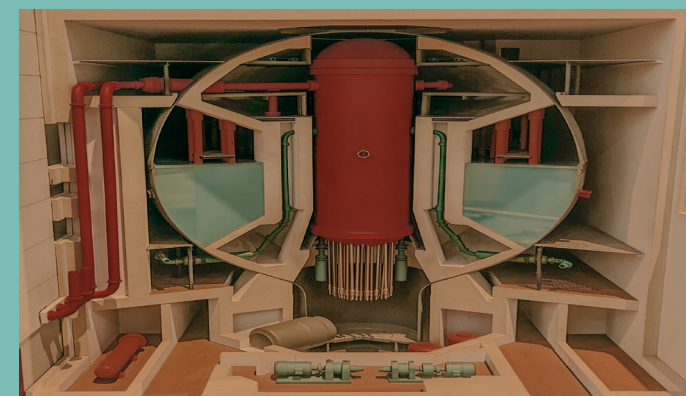
NEW AND ADVANCED REACTORS

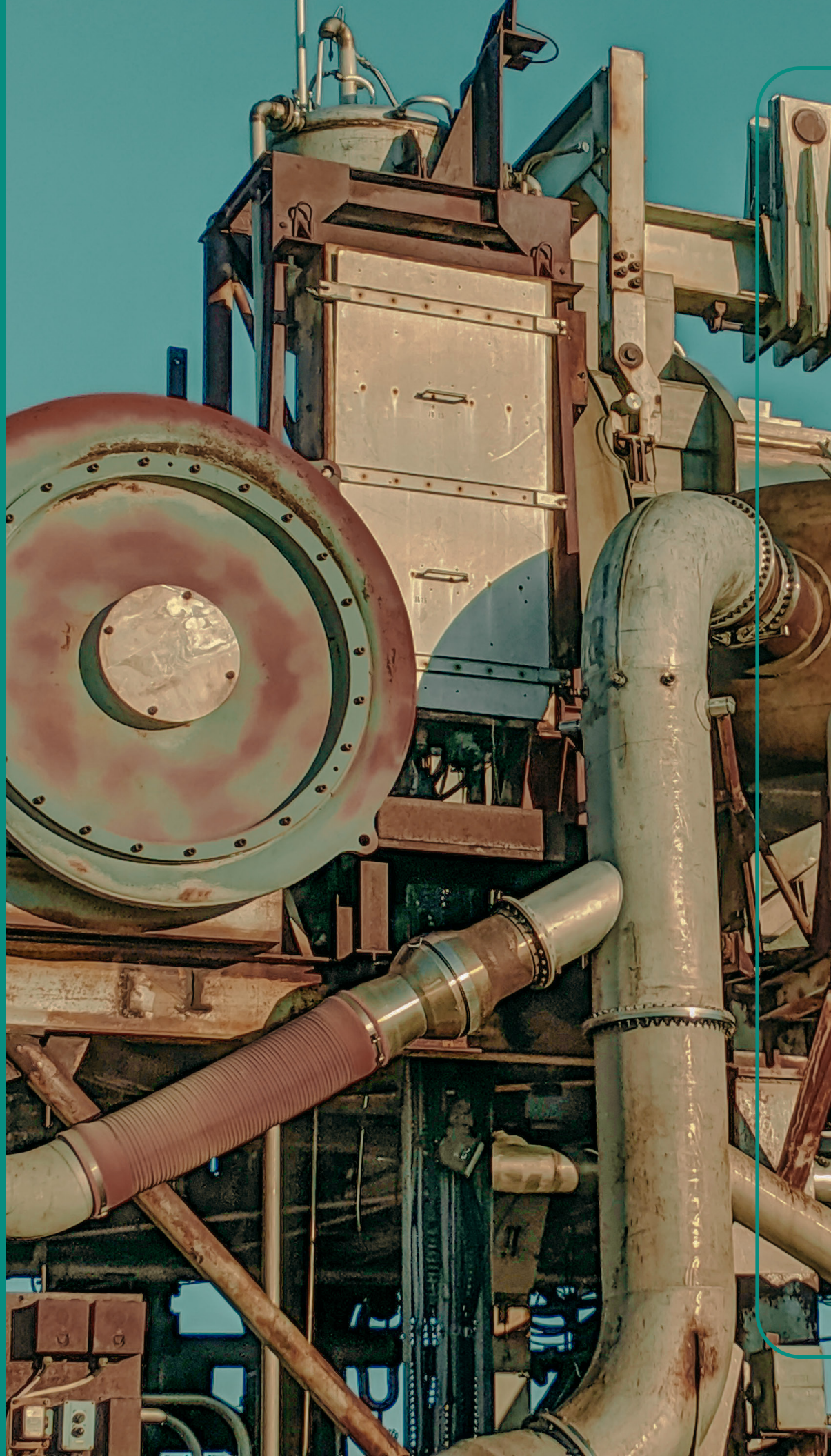
On April 27, 2023 the National Academy of Engineering hosted a webinar to present an overview of the recently released consensus study report "[Laying the Foundation for New and Advanced Nuclear Reactors in the United States](#)." The report is the result of a 2 year study by a 17 member committee and makes recommendations on best practices for the implementation of Advanced Reactors as a part of the US power system. During the webinar committee chair Dr. Richard Meserve highlighted a number of recommendations from the report including:

- The need for programs to continue testing of materials to qualify them for use in advanced reactors.
- Continuation of the DOE's Advanced Reactor Demonstration Program with a careful choice of reactors.
- Governments should provide incentives to offset some of the financial risks associated with the construction of advanced reactors for power generation.
- Consortiums can reduce the risk and allow for more knowledge to be gathered as multiple reactors are built.
- The US should support the construction of Advanced Reactors in other countries.

- Continued research into applications for reactors other than electricity generation such as process heating or or hydrogen production.
- The DOE should sponsor research into methods of site preparation and construction to increase efficiency. This can make up up to 40-50% of the cost of reactor construction.
- The NRC should develop clear regulatory required for Advanced Reactors. Additional funding should be provided to the NRC outside of its normal fees to support this.
- Community engagement and support is crucial in the construction of new reactors.

Additionally, the National Academies recently released a similar report on "[Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors](#)."





Artificial Intelligence

We asked chatGPT how AI can be used with research reactors. Here is the response:

AI can be used in various ways with research reactors to enhance their operations, improve safety, and optimize performance. Here are several applications of AI in research reactors:

1. Predictive Maintenance: AI algorithms can analyze sensor data from various components of a research reactor to identify patterns and detect anomalies. By monitoring the health of critical systems, AI can predict equipment failures or malfunctions in advance, allowing for proactive maintenance and reducing downtime.

2. Safety Monitoring: AI can be used to continuously monitor and analyze sensor data related to reactor conditions, such as temperature, pressure, and radiation levels. It can quickly identify any deviations from normal operating parameters and raise alarms or even initiate automated safety measures if necessary.

3. Optimization of Experiments: AI can assist in optimizing experiments conducted in research reactors. By analyzing historical data and experimental parameters, AI algorithms can suggest optimal conditions for specific experiments, leading to improved efficiency and more accurate results.

4. Fuel Management: AI can help optimize fuel management in research reactors by analyzing data on fuel burnup, neutron flux, and other relevant factors. It can provide insights into the best strategies for fuel loading, replacement, and utilization, ensuring efficient use of fuel resources.

5. Nuclear Safety Analysis: AI can support nuclear safety analysis by simulating various accident scenarios and assessing their potential consequences. By using AI algorithms to model and analyze complex phenomena, researchers can gain valuable insights into reactor behavior during abnormal conditions and develop better safety protocols.

6. Data Analysis and Pattern Recognition: AI can assist in analyzing large volumes of data generated by research reactors. By employing machine learning techniques, AI can identify patterns, correlations, and trends that might not be apparent to human operators. This can lead to improved understanding of reactor behavior and more informed decision-making.

7. Operator Training and Decision Support: AI-based simulators can be used for training reactor operators in various scenarios, including normal operation, abnormal conditions, and emergency situations. AI can also provide decision support tools that offer real-time recommendations to operators during critical situations, helping them make better-informed decisions.

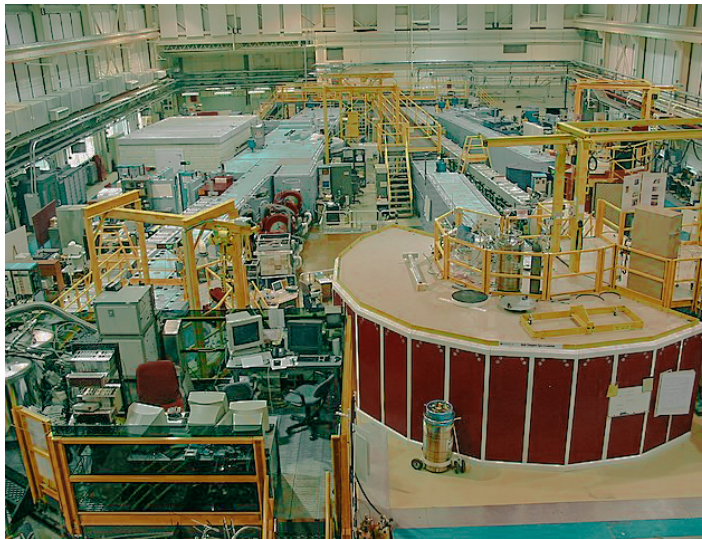
It is important to note that the application of AI in research reactors should always be accompanied by rigorous validation, verification, and quality assurance processes to ensure the reliability and safety of the systems.

The NRC has released its [Artificial Intelligence Strategic Plan](#) (NUREG-2261) for fiscal years 2023-2027.

NIST Restart Authorized

In March 2023 the [NRC approved the restart](#) of the NIST Center for Neutron Research (NCNR) a little over 2 years after the February 2021 Safety Limit Violation that led to partial melting of a fuel element. The NCNR is the most powerful NRC licensed research reactor, and one of only 3 major neutron scattering facilities in the US.

From a March 10 [announcement](#): "We've reached this decision after extensive review of the event, NIST's corrective actions, and additional work the facility has done to ensure safe operation," said Andrea Veil, director of the NRC's Office of Nuclear Reactor Regulation. "We're satisfied this research facility's important systems and components are ready to go, and we're satisfied the reactor staff are ready to carry out improved procedures for maintaining safety. We'll continue our increased oversight of the facility and its ongoing corrective actions."



Corrective Action Program Guidance

Those looking to develop or enhance their own corrective action program can refer to the IAEA's [TECDOC-1458: Effective corrective actions to enhance operational safety of nuclear installations](#) and the DOE's [DOE G 414.1-5: Corrective Action Program Guide](#).

Some key points include:

Keep the corrective action process simple. The process should not require a tremendous amount of effort or training.

Keep all personnel as involved in the program. Roles and responsibilities should be clearly defined.

Maintain strong support and emphasis on the program by management. Encourage employees at all levels in the organization to participate.

Provide easy access to reports to capture vital information. Provide timely feedback to include lessons learned so members can see results and be encouraged to support the process.

Periodically assess the effectiveness of the program and provide trending analysis of problems and associated causes to identify repeat issues and weaknesses before they pose a more significant problem.

SUBCRITICAL REACTORS IN THE US



There are 14 subcritical reactors across the US, as well 1 in Mexico, 1 planned at Ontario Tech University, and 1 planned at Oak Ridge National Lab. These reactors are primarily used for educational purposes; however, Niowave is exploring their use in accelerator driven systems as a means of isotope production. [IAEA-TECDOC-1976](#) provides guidance on the Safety and Utilization of Subcritical Assemblies.

