

# TRTR NEWSLETTER

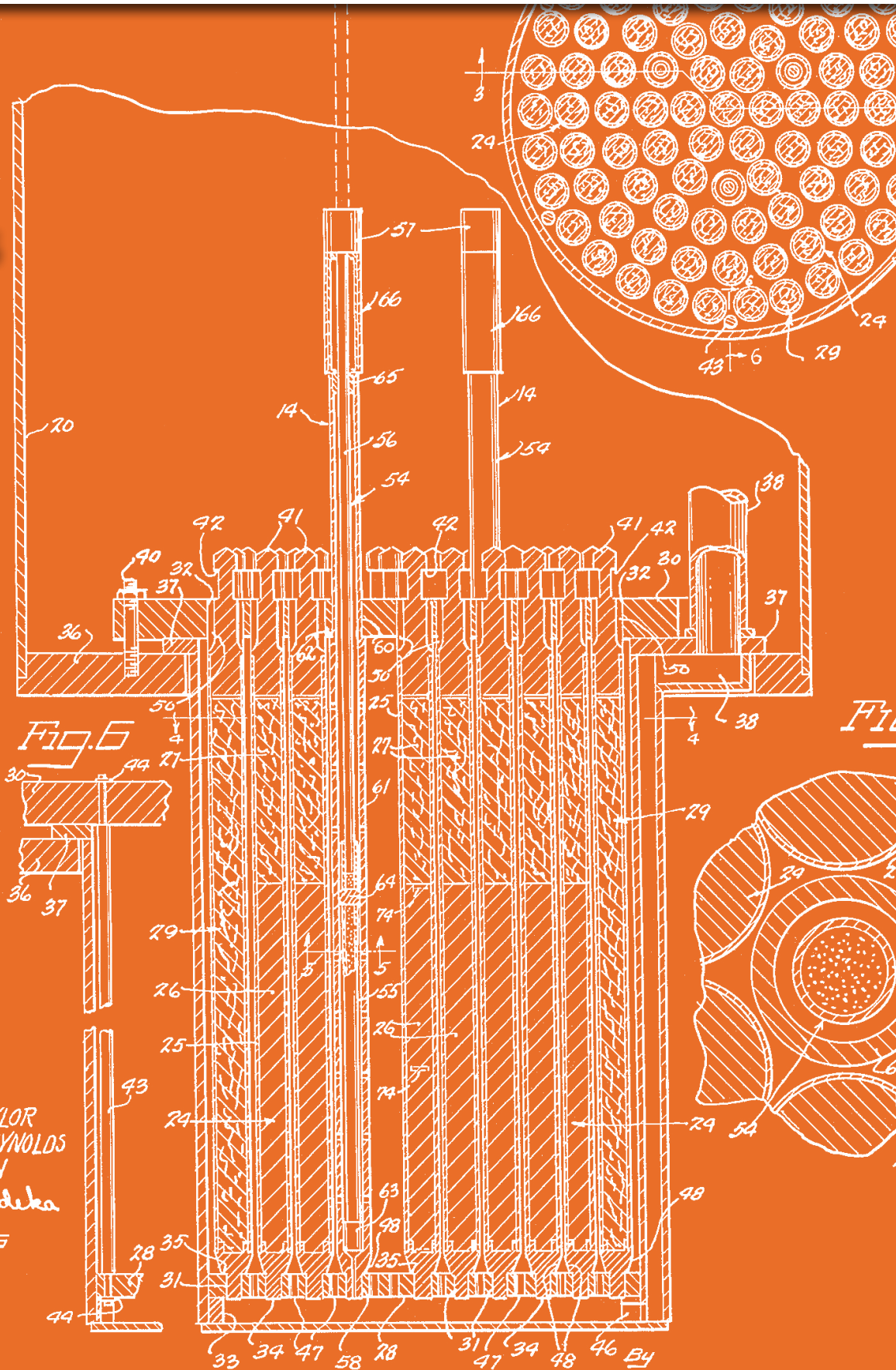
Q1 2020

NRC  
INSPECTIONS

2019 NRC  
EXAMS

KNOW MORE  
NUKES  
UNIVERSITY OF TEXAS -  
AUSTIN

REACTOR  
QUIZ!



*Inventors*  
THEODORE BREWSTER TAYLOR  
ANDREW WETHERBEE McREYNOLDS  
FREEMAN JOHN DYSON  
Scans, Anderson, Luedeka  
& Fitch Att'y's

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## ON THE COVER

An image from the original TRIGA Reactor Patent filed in 1958 by Freeman Dyson, Theodore Taylor, Andrew McReynolds, and others. Dyson, the visionary physicist and mathematician passed away on February 28th at the age of 96.

## MESSAGE FROM THE CHAIR



**H**appy Q1 to all. I hope this newsletter finds everyone warm and in good spirits with the start of the New Year. As a reminder to everyone, make sure to submit your Annual Report. For many, these are due by the end of March.

The Executive Committee continues to work on an assortment of issues facing the fleet. Among these is the standardization of the [50.59](#) review process. Under the leadership of Tom Newton, a working document has been produced and is under final review. The working group is continuing to look for case studies to include as examples. If you have any, please reach out to Tom or myself. Additionally, the ANSI/ANS standards committee continues their work on the definitions in 15.1. This important work will add clarity between licensees and the regulator on topics such as minimum staffing, initial start-up, and others.

At the 2019 Annual Meeting, a discussion was started around the “Shipper of Record” question for removal of fuel from facilities. I have been told that this issue has become a low priority compared with the TRIGA fuel line restart. As MURR and MIT are the only fuel shipments currently planned for the next couple of years, the shipper of record will continue to be handled on a case-by-case basis. If this is a continuing or upcoming issue for your facility, please reach out to me.

## EVENTS

**MARCH 22-26, 2020**

Helsinki, Finland

[European Research Reactor Conference](#)

**MARCH 29-APRIL 2, 2020**

Cambridge, England

[Physics of Reactors Conference](#)

**APRIL 5-9, 2020**

Vienna, Austria

[14th International Topical Meeting on Nuclear Applications of Accelerators](#)

**APRIL 8-9, 2020**

Atlanta, Georgia

[International SMR and Advanced Reactor Summit](#)

**APRIL 23-26, 2020**

Washington, DC

[USA Science and Engineering Festival](#)

**MAY 20-22, 2020**

Washington, DC

[Nuclear Energy Assembly](#)

**JUNE 7-11, 2020**

Glendale, Arizona

[ANS Annual Meeting](#)

There is some exciting news in the TRTR space. As of this writing, two universities are currently considering the addition of reactors. One is seriously considering a [molten salt design](#) that will likely initially operate in the “critical facility” to several kilowatt power range. This would be an interesting test of the agility of the NRC and a performance metric of the new agency alignment. A second facility will most likely be a light water reactor in the several megawatt category. No official word yet on either facility but an exciting development nonetheless.

Finally, TRTR continues to work on behalf of member facilities to keep Congress informed of the critical infrastructure mission fulfilled by the fleet. Members of the Executive Committee submitted a letter to the House Committee on Science, Space, and Technology with the pending introduction of the [Nuclear Energy Research and Development \(NERD\) Act](#). The House Committee was encouraged to continue to authorize funds for infrastructure support, leverage the diversity of the research reactor fleet, and consider fellowships to lower staffing needs and develop human capital. Additionally, as an NEI partner organization, TRTR will be participating in the “[Storm the Hill](#)” event on March 25.

If you are ever having issues or want to bounce ideas off someone, please feel free to contact anyone on the [Executive Committee](#) including myself. Our vibrant community of reactors aims to see the success of all member facilities. Here is to a productive Spring!

**Clive Townsend**  
Reactor Supervisor  
Assistant Lab Director  
Nuclear Engineering  
Purdue University

**JUNE 23-25, 2020**

Paris, France

[World Nuclear Exhibition](#)

**JULY 20-24, 2020**

Santa Fe, New Mexico

[Nuclear & Space Radiation Effects Conference](#)

**JULY 26-31**

Richmond, Virginia

[US Women in Nuclear](#)

**SEPTEMBER 1-4, 2020**

Kazan, Russia

[International Group Operating Research Reactors Conference](#)

**SEPTEMBER 13-17, 2020**

Seattle, WA

[14th International Conference on Radiation Shielding and 21st Topical Meeting of the Radiation Protection and Shielding Division](#)

**SEPT 27 - OCT 1, 2020**

Chicago, Illinois

[TRTR Annual Meeting](#)

**OCTOBER 12-16, 2020**

Buenos Aires, Argentina

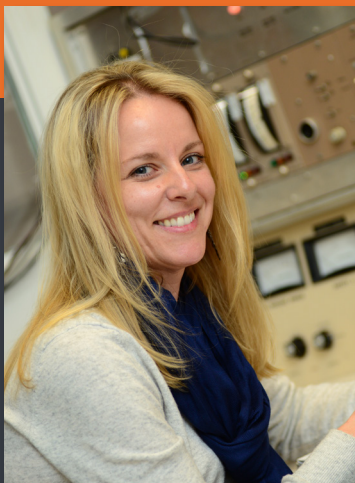
[9th International Topical Meeting on Neutron Radiography](#)

**NOVEMBER 9-13, 2020**

Vienna, Austria

[International Conference on Radiation Safety](#)

# MESSAGE FROM THE EDITOR



AMBER JOHNSON  
EDITOR



LUKE GILDE  
CONTENT EDITOR

In this issue we are excited to present the results of the [University Reactor Fitness Research Report](#). Please take the time to review and provide comments for this important community document. Previous efforts have been used to generate support for university reactors before. In the Budget Hearing for FY 1997 for DOE, NOAA, and EPA's Office of Research and Development, there was a proposal to support "[University Research Reactor's Centers of Excellence](#)." In 2001, the [University Research Reactor Task Force](#) issued a report to the DOE Nuclear Energy Research Advisory Committee.

Briefly summarized is the Category 2 public meeting between U.S. NRC staff and representatives of TRTR held on January 28, 2020. Discussed was the organizational changes in the Division of Advanced Power Reactors and Non-Power Production and Utilization Facilities ([DANU](#)). Travis Tate is the new Chief of the Non-Power Production and Utilization Oversight (UNPO) Branch. Two new inspectors also joined the UNPO, Kevin Roche and Phil O'Bryan. New project manager Molly-Kate Gavello joined Non-Power Production and Utilization Facility Licensing (UNPL).

\*Greg Casto is gathering a summary of past violations to 10 CFR 50.59 for the working group led by Tom Newton. He encouraged the submission of common license amendments for items that affect multiple facilities, such as the request to eliminate the requirement for instrumented fuel elements led by Oregon State University.

\*Duane Hardesty advised that the rulemaking on non-expiring licenses is with the

commission. Also, discussed was the status of the interpretation issues related to the senior reactor operator staffing requirements at initial startup. Les Foyto recommends a meeting of the ANSI 15.1 working group.

\*William Kennedy discussed the generic schedules and cost recovery requirements defined in the Nuclear Energy Innovation and Modernization Act ([NEIMA](#)).

The 2020 TRTR [Executive Committee](#) is: Clive Townsed (Chair), Dr. Sean O’Kelly (Past Chair), Dr. Ayman Hawari (Chair-Elect), Dr. Tom Newton (Treasurer), Amber Johnson (Secretary), Dr. Melinda Krahenbuhl, Jere Jenkins, Dr. Jeff Geuther, Dr. Steve Reese, Sarah Don, Dr. Leo Bobek, and Dan Cronin.

**Amber Johnson**  
Director  
University of Maryland  
Radiation Facilities

**Luke Gilde**  
Reactor Operations Manager  
University of Maryland  
Radiation Facilities

# NEWS

## RUSSIA FUNDS NEW RESEARCH REACTOR

Russian State Development Corporation VEB.RF and Gazprombank will finance the construction of new multipurpose fast neutron reactor. The reactor is expected to be operational in 2025. [[More](#)]

## DOE ARTICLE ON THE SIMPSON'S FAILURE TO ACCURATELY DESCRIBE NUCLEAR ENERGY

They are however “happy to point out, Springfield’s two reactors have been providing this fictional town with affordable and reliable zero-emission power for almost 30 years. That’s less than half of the lifespan of today’s commercial reactors.” [[More](#)]

## CHANGING STANCE ON LEAD APRONS

The American Association of Physicists in Medicine are recommending the use of lead aprons to shield patients during x-rays be “discontinued as routine practice.” The use of these shields may reduce imaging quality and actually lead to increased exposure to patients. [[More](#)]

## 600 EXPERIMENTS DISRUPTED AT HFIR

The 11 month shutdown of the High Flux Research Reactor due to a failed fuel element affected about 500 researchers and 600 experiments. The shutdown was put to good use however; major upgrades were made to both the experimental facilities and reactor systems. [[More](#)]

## TAIWAN'S ONLY RESEARCH REACTOR PROFILED

Taiwan's Tsing Hua Open-Pool Reactor, a 2 MW MTR, was written about in the Taipei Times. [[More](#)]

## FIRST SEMICONDUCTOR NEUTRON DETECTOR

Researchers at Northwestern University and Argonne National Lab have developed the first practical semiconductor neutron detector using a lithium-indium-phosphorous-selenium crystal. [[More](#)]

## RUSSIA'S KOLA NUCLEAR POWER PLANT'S LICENSE EXTENDED TO 2034

The license of the Kola Nuclear Power plant near Murmansk was extended until 2034. If it shuts down then it will have operated for 59 years making it the longest running power plant beating out Oyster Creek Nuclear Generating Station's 49 years. [[More](#)]

## REVIEW OF "RADIOACTIVE"

The film about Marie Curie is due to be released in March 2020. [[More](#)]

## TERRAPOWER TO OPEN A NEW RESEARCH FACILITY

TerraPower will open a new 65,000 square foot facility in Everett Washington. The lab will employ about 100 workers and work to develop the Traveling Wave Reactor. [[More](#)]

## JAPANESE COURT ORDERS REACTORS TO SHUTDOWN

The Hiroshima High Court has ordered the No. 3 reactor at the Ikata Nuclear Power Plant to halt operations. The court has ruled that the nearby Japan Median Tectonic Line is an active fault, and deemed that operations at the reactor to pose a danger to local residents. The reactor must remain offline until the Iwakuni branch of the Yamaguchi District Court rules on a full-scale lawsuit demanding that operations at the reactor be banned. [[More](#)]

## INTEREST IN VERSATILE TEST REACTOR

GE Hitachi Nuclear Energy (GEH) and TerraPower have together responded to an expression of interest (EOI) issued by Battelle Energy Alliance to determine interest in a cost-sharing partnership arrangement to design and construct the Versatile Test Reactor. [[More](#)]

## REQUEST TO EXPORT HEU

The NRC is expected to rule on a DOE request to export HEU to Belgium for use in making Mo-99. The supplier, Institute for Radioelements, is working to convert their Mo-99 production process to use LEU, but requires one more shipment of HEU to maintain the supply. [[More](#)]

## DIAMOND BATTERIES FROM REACTOR WASTE

Scientists in England are working to produce diamond batteries using the carbon 14 produced in the graphite moderator of some reactors. Such batteries could provide long lasting power sources devices like pacemakers or hearing aids. [[More](#)]

## HEAT EXCHANGERS INSTALLED AT JULES HOROWITZ REACTOR

3 heat exchangers have been installed at the Jules Horowitz Reactor under construction in France. The 100MW reactor will replace the 70MWt Osiris reactor. [[More](#)]

## WASTE REPOSITORY REJECTED IN ONTARIO

A plan to build a long term waste repository at the Bruce Power site was rejected by the Saugeen Ojibway Nation. [[More](#)]

## TERRAPOWER TRAVELING WAVE REACTOR

TerraPower's Traveling Wave Reactor written about in Medium. [[More](#)]

## YUCCA MOUNTAIN DROPPED FROM BUDGET

The president has dropped funding for the Yucca Mountain Nuclear Waste Repository from his budget request. [\[More\]](#)

## 50/50 CHANCE OF SUCCESS FOR 3 GEN IV REACTORS

Generation IV International Forum (GIF) believes that sodium-cooled, high temperature gas cooled, and molten salt have a 50/50 chance of being commercialized. [\[More\]](#)

## IDAHO AND DOE AGREE TO DEAL ON ATR SPENT FUEL

The state of Idaho and the DOE have agreed to deal on how long spent fuel from the Advanced Test Reactor may remain in storage in the state. [\[More\]](#)

## PULSTAR REACTOR – A RESEARCH REACTOR FOR THE 21ST CENTURY

The DOE's Nuclear Energy University Program describes the upgrades taking place at North Carolina State University's PULSTAR Reactor. [\[More\]](#)

## LEGACY OF RADIOACTIVE QUACKERY

An article from the Washington Post about the legacy of radioactive quack medicine products written with input from Carl Willis, an SRO at UNM. [\[More\]](#)

## RADIOACTIVE WASTE DUMPED IN INDONESIA

A site contaminated with Cs-137 has been found in Jakarta, Indonesia. Dose rates as high as 68 Rem/hr have been identified. The source of the contamination has not yet been identified, but is suspected to be from a nearby nuclear reactor. [\[More\]](#)

## LISE MEITNER

Lise Meitner's contributions to and exclusion from the world of physics. [\[More\]](#)

## FIRST NUCLEAR REACTOR IN ARAB NATION

The United Arab Emirates has approved its nuclear reactor to begin operations. This will be the first nuclear power plant in an Arab Nation. The country hopes to have 4 operational reactors by 2023. [\[More\]](#)

## GEORGIA NUCLEAR AIRCRAFT LAB

A brief description of the Georgia Nuclear Aircraft Laboratory which operated from the 1950s to the 1970s. [\[More\]](#)

## HOMEMADE FUSOR FOR SALE IN NEW ZEALAND

A homemade fusor built by a student for a science fair in New Zealand is for sale. [\[More\]](#)

## NEW REACTOR AT INL

Oklo Inc.'s Aurora reactor has been chosen by INL to demonstrate a microreactor fueled by High Assay Low Enriched Uranium (HALEU) fuel. [\[More\]](#)

## REACTOR RESTART APPROVED IN JAPAN

The No. 2 unit of Tohoku Electric Power Co.'s Onagawa plant has been approved to restart once post Fukushima upgrades are completed in March. It will be just the second reactor damaged by the Tsunami approved to restart. [\[More\]](#)

## BORON NEUTRON CAPTURE THERAPY CENTER AT NATIONAL TSING HUA UNIVERSITY

Taiwan's only research reactor has been used to treat over 120 cancer patients. [\[More\]](#)



# BY THE NUMBERS

## 2019 NRC INSPECTIONS



32

Operational Inspections

46

8

Security Inspections

Total Inspections

2

For New Consoles

2

Reactive Inspections

2

For Fuel Shipment



27

Facilities Were Inspected

9

Violations Recorded

6

Inspectors

IV

Highest Severity

# NRC INSPECTIONS

## AFRRI

A reactive inspection of the Armed Forces Radiobiology Research Institute reactor facility was carried out on November 14, 2019. The inspection was to follow up on the incident reported to the NRC by a member of the staff on October 24, 2019, regarding your material control and accounting program. The NRC identified an apparent violation regarding the incident and the issue will be further evaluated on January 22nd, 2020. The inspection report is [ML19353C985](#).

## MASSACHUSETTS INSTITUTE OF TECHNOLOGY

An inspection of the Massachusetts Institute of Technology Nuclear Reactor Laboratory was carried out from November 4-8, 2019. The inspection included a review of organization and staffing, review, audit, and design change functions, radiation protection, and transportation of radioactive material. One inspection follow-up item (IFI) was identified regarding a cooling tower plume catcher. The complete inspection report is [ML19360A241](#).

## UT AUSTIN

An inspection of the University of Texas at Austin Nuclear Engineering Teaching Laboratory was carried out from November 18-21, 2019. The inspection included a review of organization and staffing, operations logs and records, requalification training, surveillance and limiting conditions for operation (LCO), emergency planning, maintenance logs and records, fuel handling logs and records. No issues were identified. The complete inspection report is [ML19346G731](#).

# 2019 NRC EXAMS

# 98

98 Operator candidates took NRC RO or SRO exams in 2019

# 88

88% of candidates passed their exam

# 25

The NRC conducted 25 licensing exams at 20 facilities in 2019



# 17

The largest number of candidates in a single exam was 17

# 4

The NRC currently has 4 RTR examiners

# 1

The NRC issued 1 requalification exam in response to Purdue's extended shutdown to install a new digital console

## IDAHO STATE

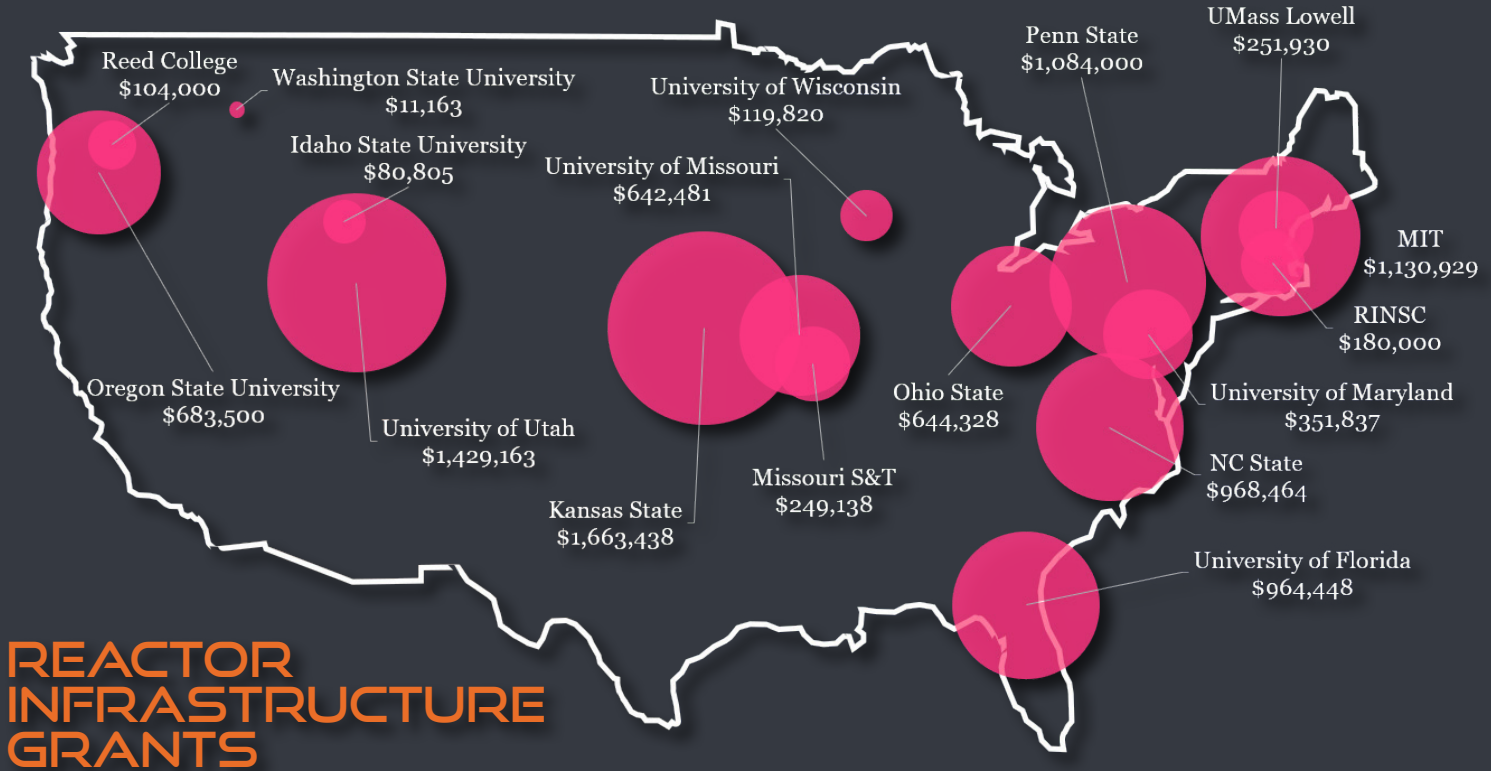
An inspection of the Idaho State University Aerojet-General Nucleonics-201M Research Reactor Facility was carried out from December 3-4, 2019. The inspection included a review of the research reactor safety program design changes. No issues were identified. The complete inspection report is [ML20006G121](#).

## USGS

An inspection of the U.S. Geological Survey TRIGA Reactor Facility was carried out from December 2-5, 2019. The inspection included a review of organization and staffing, operations logs and records, procedures, requalification training, surveillance and limiting conditions for operation (LCO), experiments, radiation protection, environmental monitoring, design changes, committees, audits and reviews, emergency planning, maintenance logs and records, fuel handling logs and records, and, transportation of radioactive materials. No issues were identified. The complete inspection report is [ML19347D259](#).

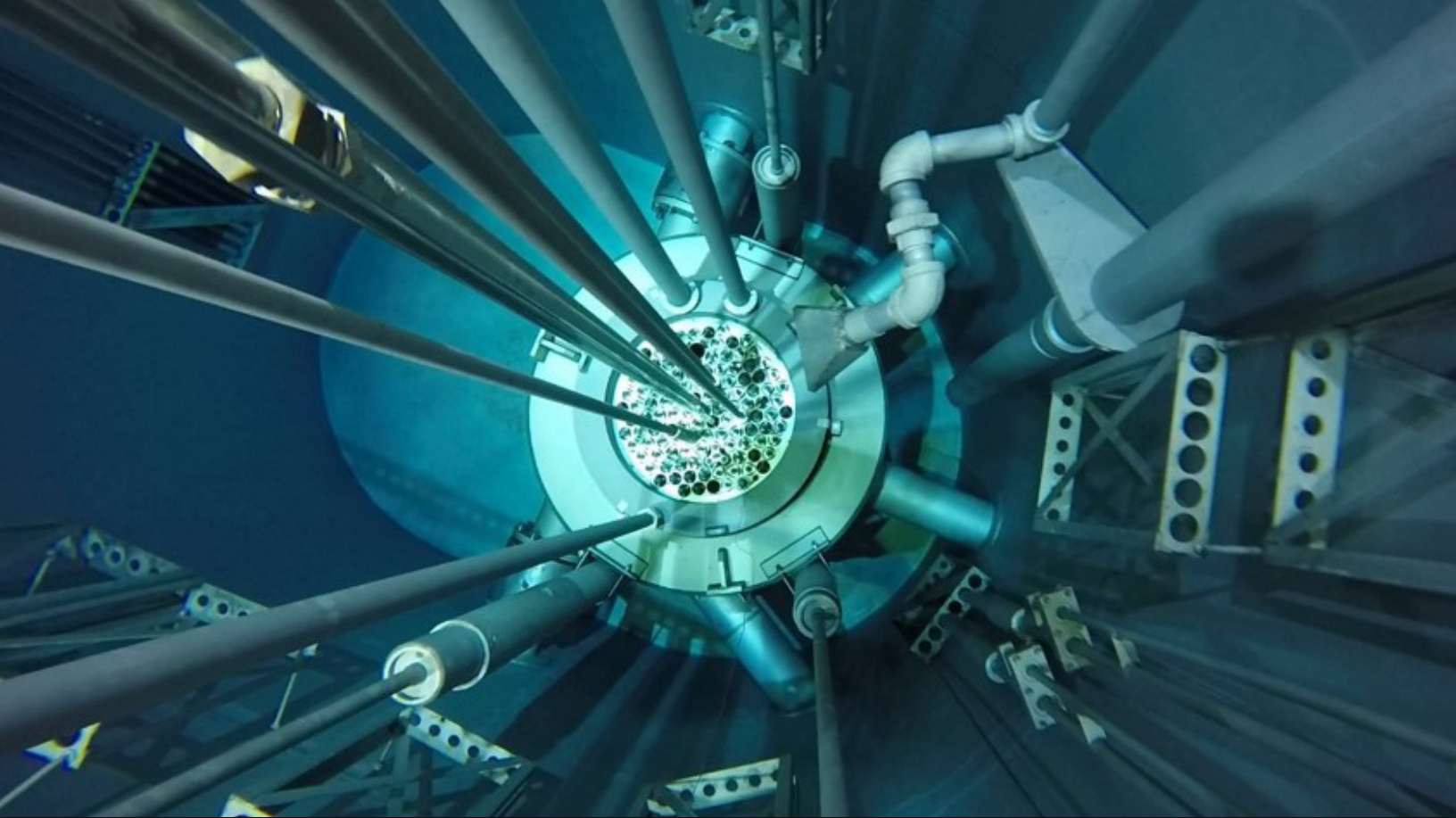
## TEXAS A&M

An inspection of the Texas A&M Nuclear Science Center TRIGA was carried out from November 18-12, 2019. 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. Two severity level IV violations were identified; one for failure to place an operator who did not satisfactorily complete a requal exam in an accelerated requal program, and one for failure to properly verify the reliability of the ventilation system weekly as required by Technical Specifications. The complete inspection report is [ML19333B971](#).



<b>Oregon State TRIGA Reactor</b>	Corvallis, OR
2016 <a href="#">Secondary Cooling, NI Upgrade</a>	\$683,500
<b>WSU Reactor</b>	Pullman, WA
2017 <a href="#">Stack Gas Monitor</a>	\$11,163
2016 <a href="#">CAM</a>	\$35,899
<b>Reed Research Reactor</b>	Portland, OR
2019 <a href="#">LSC, CAM, Stack Gas Monitor</a>	\$104,000
<b>ISU Nuclear Engineering Lab</b>	Pocatello, ID
2016 <a href="#">NI Upgrades</a>	\$80,805
<b>Utah University Research Reactor</b>	Salt Lake City, UT
2018 <a href="#">New Console</a>	\$995,600
2016 <a href="#">NI Upgrades</a>	\$433,563
<b>KSU TRIGA Research Reactor</b>	Manhattan, KS
2018 <a href="#">Hot Materials Lab</a>	\$167,493
2015 <a href="#">New Console</a>	\$1,499,945
<b>MURR</b>	Columbia, MO
2018 <a href="#">Reg Rod, Rad Hard Camera</a>	\$109,782
2017 <a href="#">Stack Gas Monitor, Digital Chart Recorder</a>	\$319,067
2015 <a href="#">E-beam welding, Security Upgrades, NI Upgrades</a>	\$213,632
<b>Missouri S&amp;T Nuclear Reactor</b>	Rolla, MO
2018 <a href="#">Crane Maintenance, Portal Monitor, Digital Chart Recorder</a>	\$249,138

<b>U of Wisconsin Nuclear Reactor</b>	Madison, WI
2018 <a href="#">HPGe Coolers</a>	\$36,300
2017 <a href="#">Rad Monitoring Equipment</a>	\$61,460
2015 <a href="#">Rad Monitoring Equipment</a>	\$22,060
<b>OSU Research Reactor</b>	Columbus, OH
2019 <a href="#">CRDMs</a>	\$230,000
2017 <a href="#">Shielding for Beamports</a>	\$184,328
2016 <a href="#">CRDM Upgrades</a>	\$230,000
<b>Penn State Breazeale Reactor</b>	State College, PA
2017 <a href="#">New Console</a>	\$1,084,000
<b>NC State PULSTAR Reactor</b>	Raleigh, NC
2018 <a href="#">Hot Cells</a>	\$488,464
2016 <a href="#">Console Upgrades</a>	\$480,000
<b>U of Florida Training Reactor</b>	Gainseville, FL
2018 <a href="#">Hot Cell Refurbishment</a>	\$281,321
2015 <a href="#">Integrated Nuclear Fuel &amp; Structural Materials (INFS) research center</a>	\$683,127
<b>Maryland Univ Training Reactor</b>	College Park, MD
2018 <a href="#">Digital Chart Recorder, Rad Hard Camera</a>	\$36,717
2017 <a href="#">Fission Chamber, Core Upgrade, Gamma Spec Upgrade</a>	\$315,120
<b>RINSC</b>	Narragansett, RI
2016 <a href="#">Stack Gas Monitor</a>	\$180,000
<b>UMass Lowell Radiation Lab</b>	Lowell, MA
2016 <a href="#">Heat Exchanger, Fission Chamber</a>	\$251,930
<b>MIT Nuclear Reactor Laboratory</b>	Cambridge, MA
2018 <a href="#">Hot Cells</a>	\$631,289
2016 <a href="#">NI Upgrades</a>	\$499,640



# KNOW MORE NUKES - UNIVERSITY OF TEXAS AUSTIN

IN THIS EDITION OF KNOW MORE NUKES WE VISIT THE UNIVERSITY OF TEXAS AT AUSTIN NUCLEAR ENGINEERING TEACHING LABORATORY. LARRY HALL, REACTOR MANAGER, HAS PROVIDED THE RESPONSES TO OUR QUESTIONS.

## WHAT YEAR DID YOUR REACTOR FIRST GO CRITICAL?

This facility (which is the second location) went critical in 1992. The first University of Texas reactor was located on main campus and went critical in 1963.

## WHAT IS THE REACTOR LICENSE NUMBER? POWER LEVEL?

The license number is R129 and it is a 1.1 MW TRIGA II.

## WHAT IS YOUR POSITION AT THE REACTOR? HOW LONG HAVE YOU HELD THAT POSITION?

My position is Reactor Manager and I have been here a little over 3 years.

## HAVE ANY MAJOR CHANGES/ MODIFICATIONS, SUCH AS CONVERSION, POWER UPGRADE, ETC..., BEEN DONE?

The original reactor that went critical in 1963 was a 10kW reactor. In 1968 it was upgraded

to a 250kW reactor. When the new facility was completed, it was rated as a 1.1MW reactor.

## WHAT IS A UNIQUE FEATURE OF YOUR REACTOR?

Unlike most TRIGA II reactors, we have a hexagonal pitch. Additionally, we have 2 positions where we can remove 3 elements and another position that can remove 6 or 7 elements to place experimental facilities. Finally, we have 5 beam ports.

## WHAT IS A FUN FACT ABOUT YOUR REACTOR?

The conspiracy theorist, Alex Jones, had a segment in 2012 about the hidden reactors in Austin and showed the wrong building of where the reactor was.

## WHAT IS THE BIGGEST CHALLENGE FACING YOUR REACTOR?

Finding replacement components for aging computer and safety systems.

## WHAT IS THE MOST UNUSUAL REQUEST SOMEONE HAS HAD TO USE YOUR REACTOR?

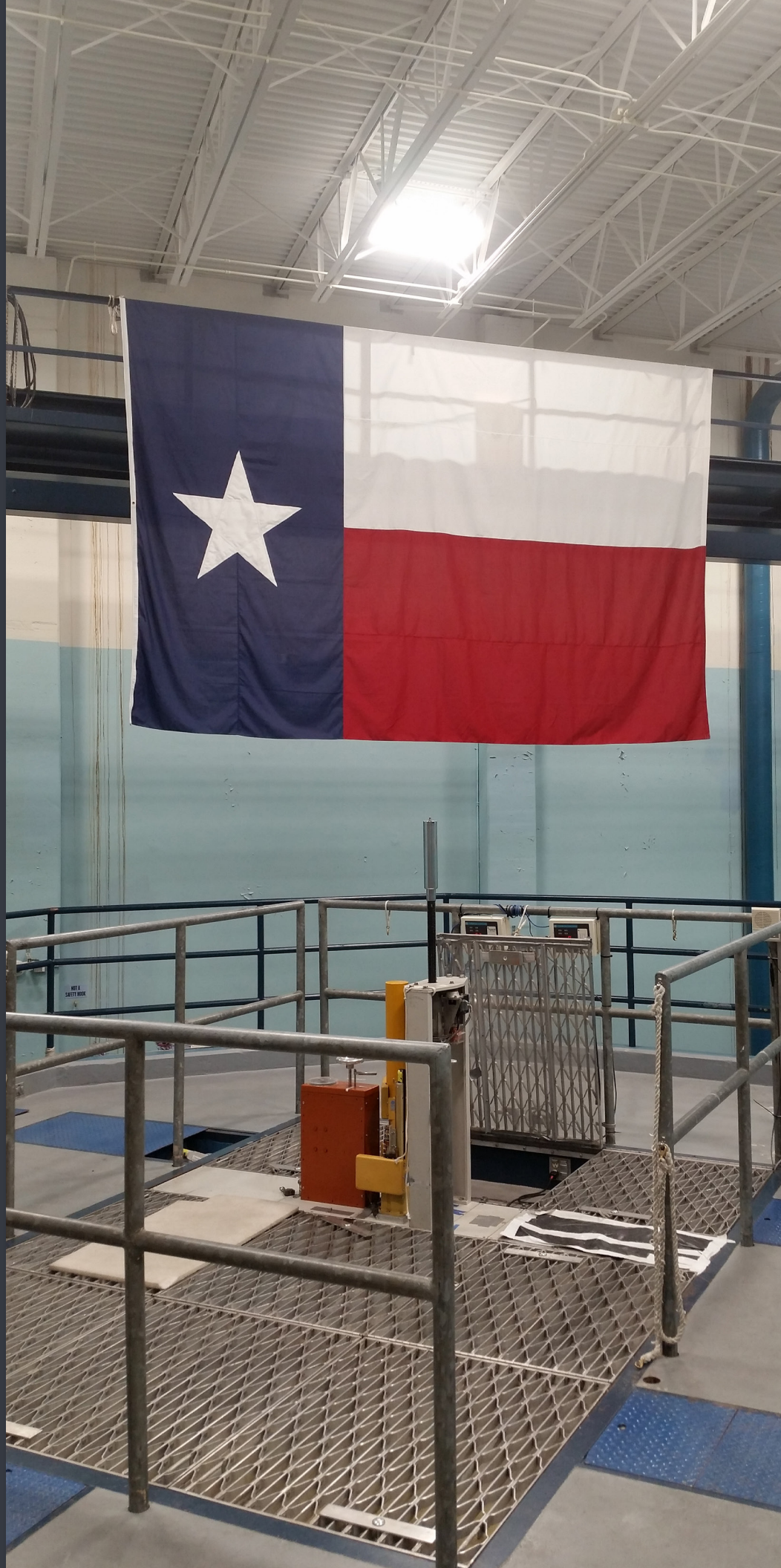
To measure gold particles in mice feces and tissue. It was to determine what size particles would remain in certain organs. It is part of an experiment to try and provide internal medicine in a more localized manner.

## WHAT DREW YOU TO YOUR CURRENT POSITION?

Money for food...ha ha, it was for the opportunities and challenges. It is great to have a different job every day since you are constantly tackling unique issues. It keeps it interesting and prevents life from becoming boring.

## WHAT HAS BEEN YOUR FAVORITE PROJECT?

Working on the Texas Cold Neutron system and seeing how low we can detect hydrogen





TITLE PAGE: UT  
AUSTIN REACTOR  
CORE

PREVIOUS: TEXAS  
STATE FLAG OVER  
REACTOR CORE

LEFT: STUDENT  
ANTHONY  
SANDOVAL AT THE  
CONTROLS

concentrations. We have worked on detector filters, helium induced bags and placing vacuum on the beam lines. It is pretty amazing how low we have been able to measure.

**BEFORE WORKING AT YOUR REACTOR, WHAT WAS THE MOST UNUSUAL OR INTERESTING JOB YOU'VE EVER HAD?**

I started out my military career as a nuke on submarines for 11 years serving on the Woodrow Wilson SSBN 624 and USS Ohio SSBN 726 before teaching at Trident Training Facility. After I received my commission in

the Navy, I became an Explosive Ordnance Technician for 19 years disabling IEDs in Iraq...so those were some pretty unique jobs.

**WHAT DO YOU FIND THE MOST CHALLENGING AT REACTOR?**

Tracking all the facility projects that are going on while maintaining the reactor.

**WHAT ADVICE WOULD YOU GIVE TO NEW REACTOR OPERATORS?**

Continue learning about your reactor, learn how to troubleshoot effectively and critically think about how the reactor reacts in different scenarios.

**WHAT ARE THREE CAREER LESSONS YOU'VE LEARNED THUS FAR?**

1. Everything takes a little longer than you think it will, 2. Always have 2 people qualified to perform every job, 3. The tried and true...always lead by example.

We are lucky at The University of Texas, we have a super team... like I am sure most reactors do. We run about 200 days a year and it takes all the different skill sets to keep this place operating smoothly. We have taken on 2 loads partially used fuel, had to modify sub critical reactor fuel and MCZPR fuel to ship it out and they were both completed without skipping a beat.

# REACTOR FITNESS RAI TIMELINES

[NSUF University Research Reactor Fitness Study Report](#) has identified the following items as high priority for the Research Reactor community:

## INFRASTRUCTURE

[Matthew Lund](#) - University of Utah

Identification of replacement schedule and costs across all the reactors.

Applicant labor costs for upgrades and basic infrastructure upgrades are not covered by FOA award.

## REGULATION AND LICENSING

[Bruce Meffert](#) - University of Missouri Research Reactor

Lack of effective process for clarifying regulatory interpretations.

Uncertainty and perception of regulatory risk in making facility changes.

## STAFFING AND KNOWLEDGE TRANSFER

[Dr. Jeff Geuther](#) - Pennsylvania State University

Sharing best practices on documentation and knowledge transfer between facilities.

Increasing knowledge sharing between national laboratories and universities.

## UTILIZATION AND RELEVANCY

[Clive Townsend](#) - Purdue University

Developing funding to support utilization infrastructure and staff.

Communicating the capabilities and impact to universities and funding agencies.

After reviewing the report, please contact the working group chair with comments or suggestions. This information will provide valuable input to the NSUF Annual Nuclear Energy R&D Capabilities Gap Analysis Report for FY 2020.

Signed into law last year was the Nuclear Energy Innovation and Modernization Act ([NEIMA](#)).

Section 102(c) requires that the NRC develop performance metrics and milestone schedules for specific activities defined in Section 3(10): (A) the processing of applications for (i) design certifications or approvals; (ii) licenses; (iii) permits; (iv) license amendments; (v) license renewals; (vi) certificates of compliance; and (vii) power uprates; and (B) any other activity requested by a licensee or applicant.

The NRC has published a [generic milestone schedule](#) on their website. To assist the Office of Nuclear Reactor Regulation with the issuance of effective and clear RAIs, [LIC-115](#), “Processing Requests for Additional Information” is available. Time lines relevant to a non-power production or utilization facility are reprinted in the table:

GENERIC MILESTONE TO ISSUE FINAL SAFETY EVALUATION	
LICENSES	36 MONTHS
PERMITS AND AUTHORIZATIONS	36 MONTHS
LICENSE AMENDMENTS (INCLUDING POWER UPRATES)	24 MONTHS
LICENSE RENEWALS	36 MONTHS

# REACTOR QUIZ!

WHICH OF THE FOLLOWING REACTORS NEVER EXISTED?

1. A NUCLEAR REACTOR OPERATED IN OUTER SPACE
2. A NUCLEAR REACTOR OPERATED BENEATH THE GREENLAND ICE SHEET
3. A NUCLEAR REACTOR IN NEW YORK CITY
4. A NUCLEAR REACTOR IN DISNEY WORLD
5. A NUCLEAR REACTOR OPERATED IN AN AIRPLANE
6. A NUCLEAR REACTOR CONTROLLED BY PUMPING LIQUID HYDROGEN THROUGH THE CORE
7. A NUCLEAR REACTOR THAT USED DRY ICE AS A MODERATOR
8. A NATURALLY OCCURRING NUCLEAR REACTOR
9. A NUCLEAR REACTOR WHICH SHUTDOWN BY BLOWING ITSELF APART IN A CONTROLLED MANNER
10. A NUCLEAR REACTOR IN ANTARCTICA



## ANSWER KEY:

1) Nuclear reactors in outer space are very real, both the United States and Soviet Union sent small fission reactors into space to power satellites. 2) Launching a project to test the feasibility of building missile base beneath the Greenland Ice Sheet included power from a small, semi-portable nuclear reactor. 3) A **1. Van Allen Probes Reactor** was operated at Manhattan College from 1964 to 1996. Columbia University built a **TRIGA Mark II reactor** in the 1960s, but never fueled it due to opposition from the community. 4) This reactor never existed; although a law was passed in 1967 by the State of Florida allowing Disney World to build a nuclear power plant the idea never seemed to be seriously considered. 5) Both the US and Soviet Union built and flew **aircraft with nuclear reactors** onboard to evaluate shielding requirements for nuclear power aircraft. 6) Efforts to develop **nuclear rocket engines** have focused on pumping liquid hydrogen through a reactor core to cause it to go critical. Numerous tests of these reactors have been made including operations of up to 2 hours. 7) The Nazi effort to build a nuclear reactor included a sub-critical pile **moderated by dry ice** in an effort to avoid the same problem with boron contamination of graphite that the US faced. 8) Approximately 1.7 billion years ago 16 **nuclear reactors** operated for a few hundred thousand years in Oklo, Gabon. 9) **Fast Flux Reactors** are designed to go supercritical and the resulting thermal shock wave causes the fuel to reduce in density enough to render the reactor sub-critical and separate the parts of the core. 10) From 1961 to 1972, MCMurdo Station in Antarctica was powered by a PM-3A nuclear reactor known as **"Nimrod 3A"**.