THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

DEPARTMENT OF
NUCLEAR ENGINEERING

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Study Nuclear Engineering: Save the World

NUCLEAR ENGINEERING

UT has the first NE department in the US

- Offer BS, MS, PhD degrees in two tracks
  - Traditional nuclear power engineering
  - Radiological engineering
- Relevant BS minors
  - Reliability and Maintenance Engineering
  - Cybersecurity
  - Decommissioning and Environmental Management
- Close collaborations with ORNL, Y-12, Thompson Cancer Center
- Strategic Plan and Annual Report are online at ne.utk.edu

High Impact Practices

(National Survey of Student Engagement--NSSE)

Community Based Learning (student society)

Study Abroad (12/yr)

Undergraduate Research (66%)

Formal UTNE Curriculum

Senior Design (100%)

Internships and Co-Op (55%)

Q: Where are the high-impact practices located?

A: Experiential co-curricular

George Kuh, *High Impact Practices: What are they, who has access to them, and why they matter*. (AAC&U, 2008)

Nuclear Engineering-Related Minors

Earn a Minor with your BS in Nuclear Engineering and increase your knowledge, expertise, and employability. The following minors are desired by nuclear engineering utilities and industry.

Concepts of Cybersecurity Minor

- ECE 461 - Introduction to Computer Security
- ECE 462 - Cyber-Physical Systems Security
- *NE 362 - Numerical Methods and Fortran**
- STAT 251 - Probability and Statistics for Scientists and Engineers*
- *NE 351 - Nuclear System Dynamics, Instrumentation, and Controls**

Nuclear Decommissioning and Environmental Management

- NE 404 Nuclear Fuel Cycle
- *NE 433 or NE 233 Principles of Health Physics**
- CE 340 Construction Engineering and Management I
- *NE 406 Radiation Shielding**
- NE 542 Management of Radioactive Materials

Reliability and Maintainability Engineering Minor

- *NE 401 - Radiological Engineering Laboratory**
- NE 483 - Introduction to Reliability Engineering
- NE 484 - Introduction to Maintainability Engineering
- STAT 251 - Probability and Statistics for Scientists and Engineers*
- *NE 351 - Nuclear System Dynamics, Instrumentation, and Controls**

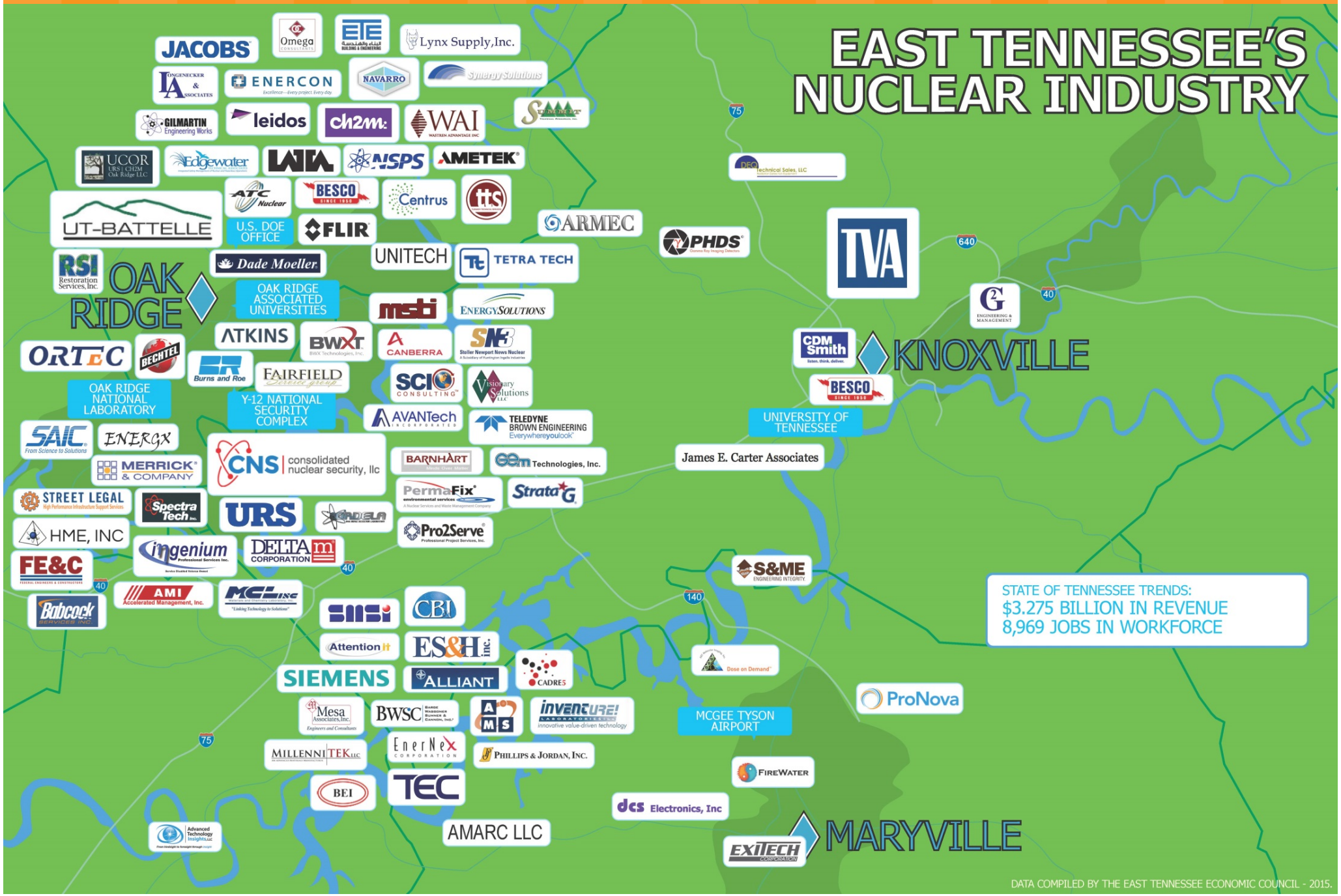
Nuclear Safety Minor

- *NE 360 - Reactor Systems and Safety*
- *NE 402 - Nuclear Engineering Laboratory**
- NE 485 - Process System Reliability and Safety
- NE 486 - Nuclear Licensing
- NE 421 - Introduction to Nuclear Criticality Safety

Required for traditional track

*Required for radiological track

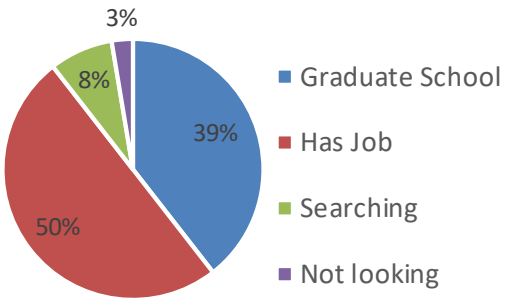
Opportunities for Nuclear Abound



2019 NE Placement and Salary Data

- Employment Status for

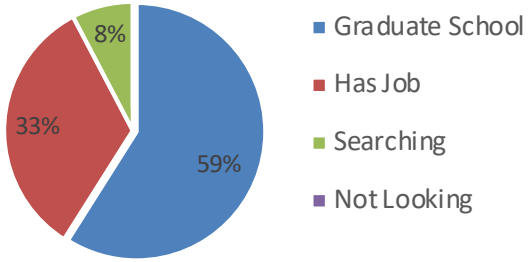
	2019	2018	2017
– Employed full time:	50%	33%	27%
– Graduate school:	39%	59%	46%
– Still Seeking:	8%	8%	24%
– Not Looking	3%	0%	6%



2019

- Mean GPAs

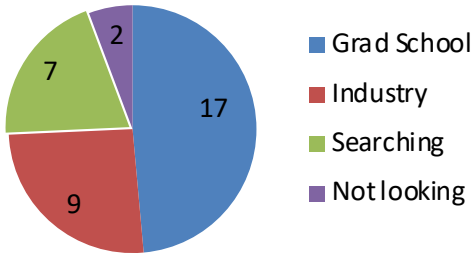
	2019	2018	2017
– Graduate School:	3.6	3.6	3.7
– Employment:	3.5	3.2	3.5
– Still Looking:	2.9	3.2	3.1



2018

- Salary Data (2018)

	median	range
– BS:	$71,000	[56k – 101k]
– MS (2017):	$120,000	[120K]
– PhD:	$93,500	[70k – 117k

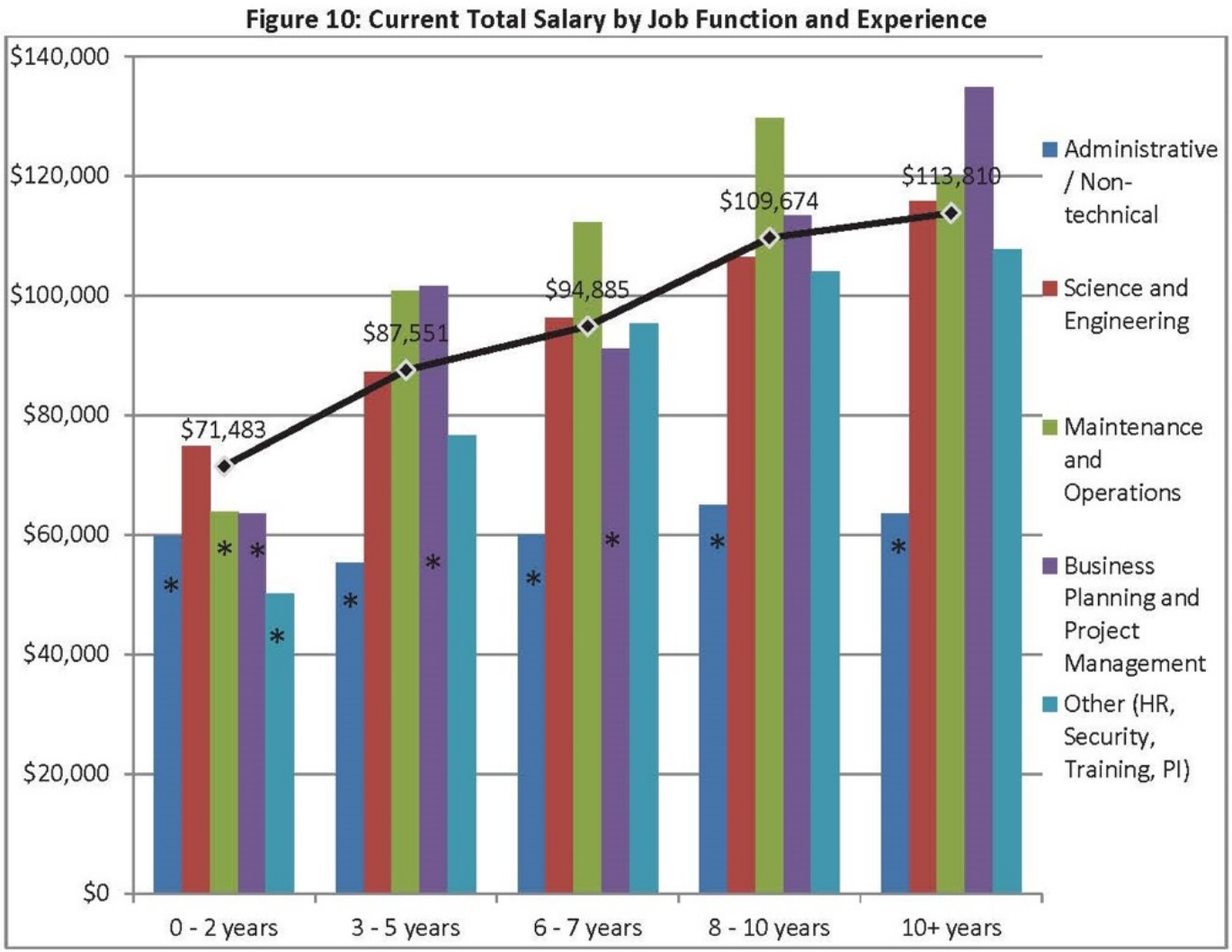


2017

Top Employers: Southern Co. (3), NN Shipyard: HII (3), US Navy (3), Dominion (3)

Southern Nuclear | Huntington Ingalls Industries — Hard Stuff Done Right™ | U.S. NAVY | Dominion Energy | CNS consolidated nuclear security, llc — PANTEX PLANT | Y-12 NATIONAL SECURITY COMPLEX | NFS NUCLEAR FUEL SERVICES, INC. | TVA

NAYGN Salary Survey (2016)



*Less than 10 respondents in this category

Salary Growth

Years	Change
0-2	+1.1%
3-5	+7.7%
6-7	+7.5%
8-10	+13.9%
10+	+0.8%

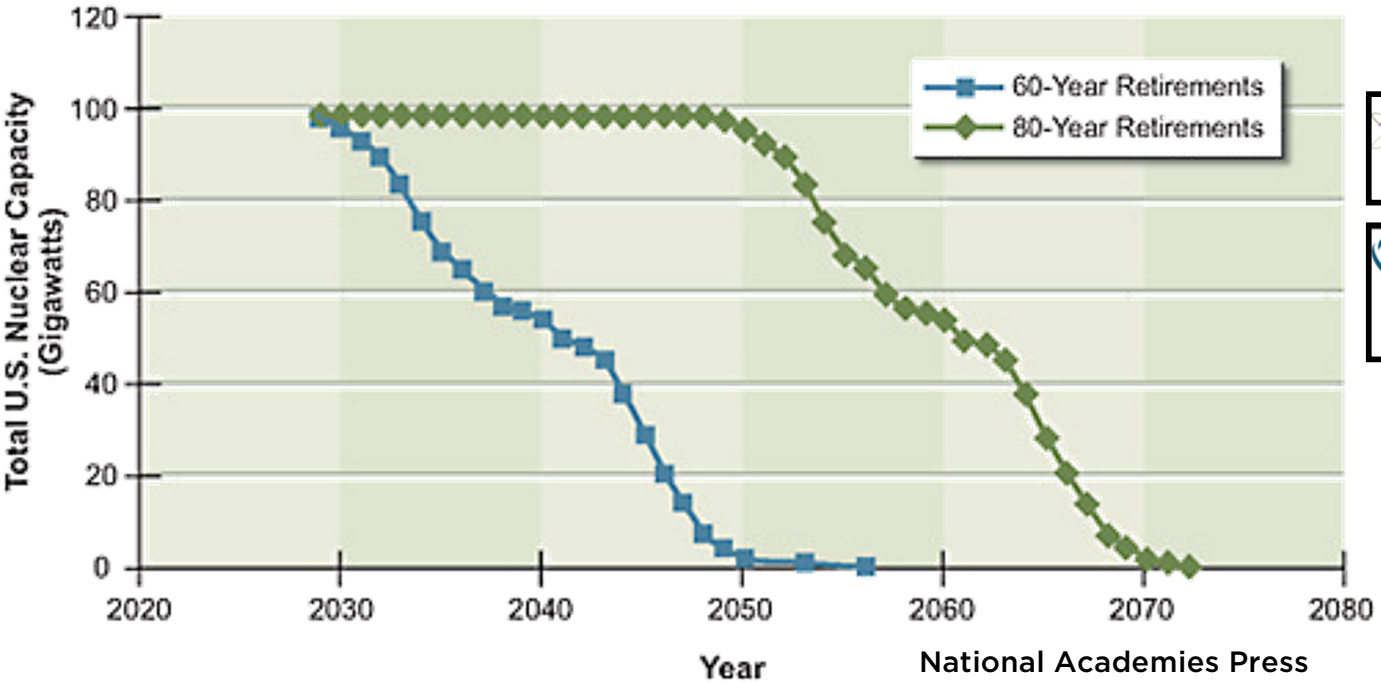
New Engineering Complex

Current Status

https://tickle.utk.edu/new-engineering-complex/

Prof. Nick Brown
Reactor and Fuel Safety

Analysis and design to enhance the safety, sustainability, and flexibility of nuclear energy

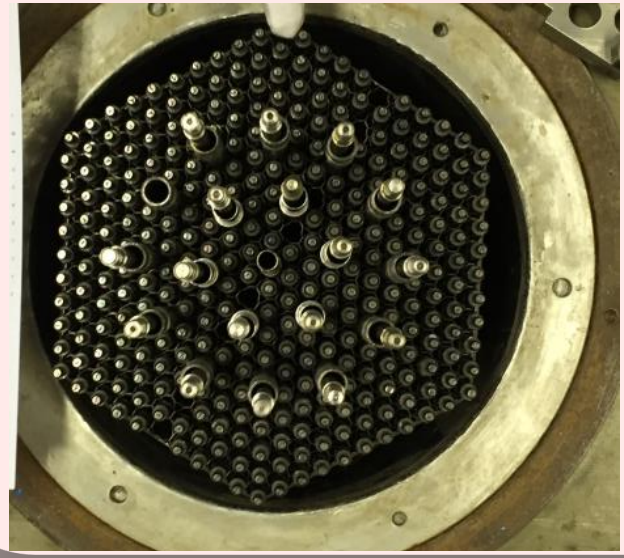


National Academies Press

What we do!

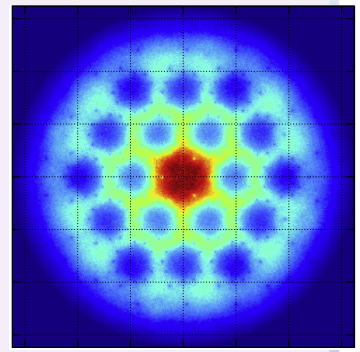
DEPARTMENT OF NUCLEAR ENGINEERING

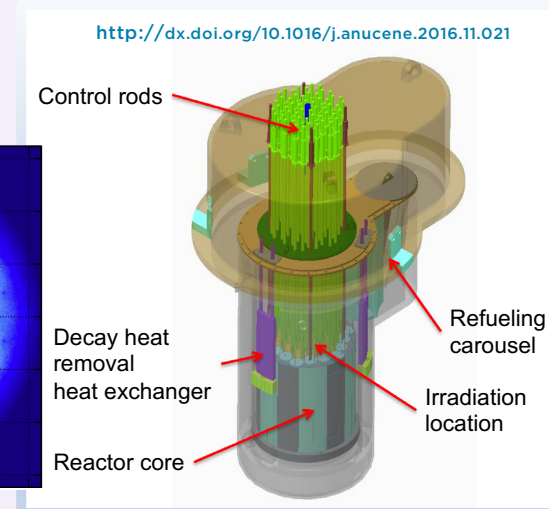
Reducing the burden of nuclear waste for future generations



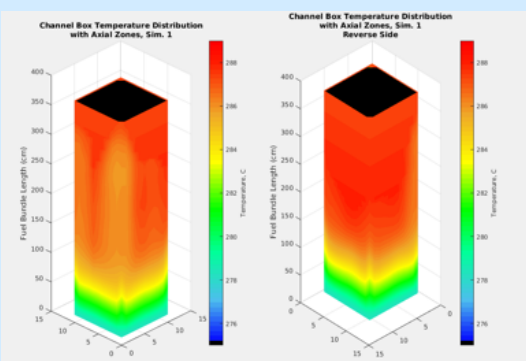
ORNL/TM-2016/729

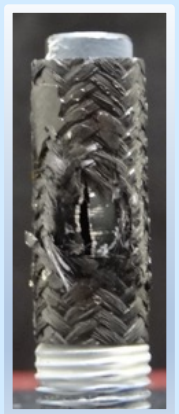
Exploring new missions for advanced nuclear energy

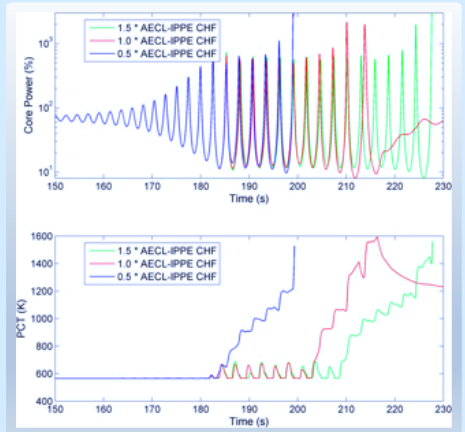


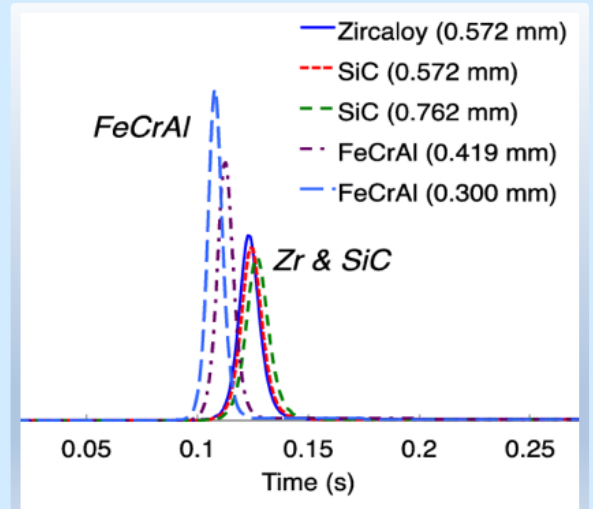


Accident Tolerant Nuclear Fuel and Cladding: Enhancing the safety of existing nuclear reactors





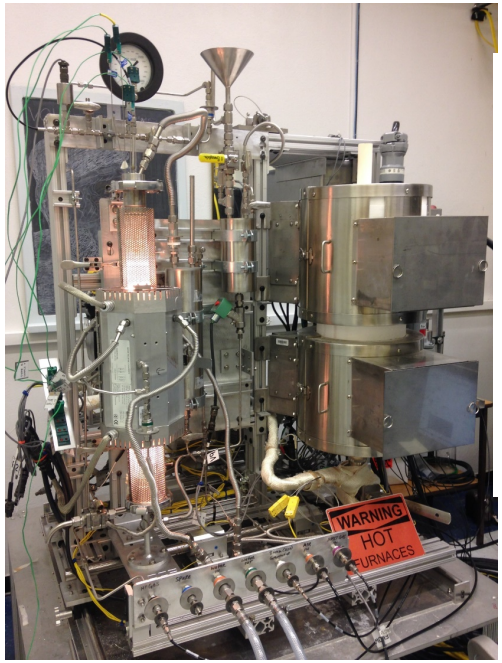


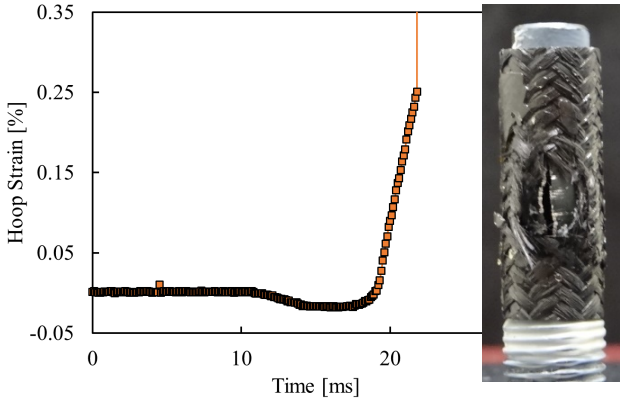


http://dx.doi.org/10.1016/j.anucene.2016.09.033

Opportunities for Fuel Safety Research

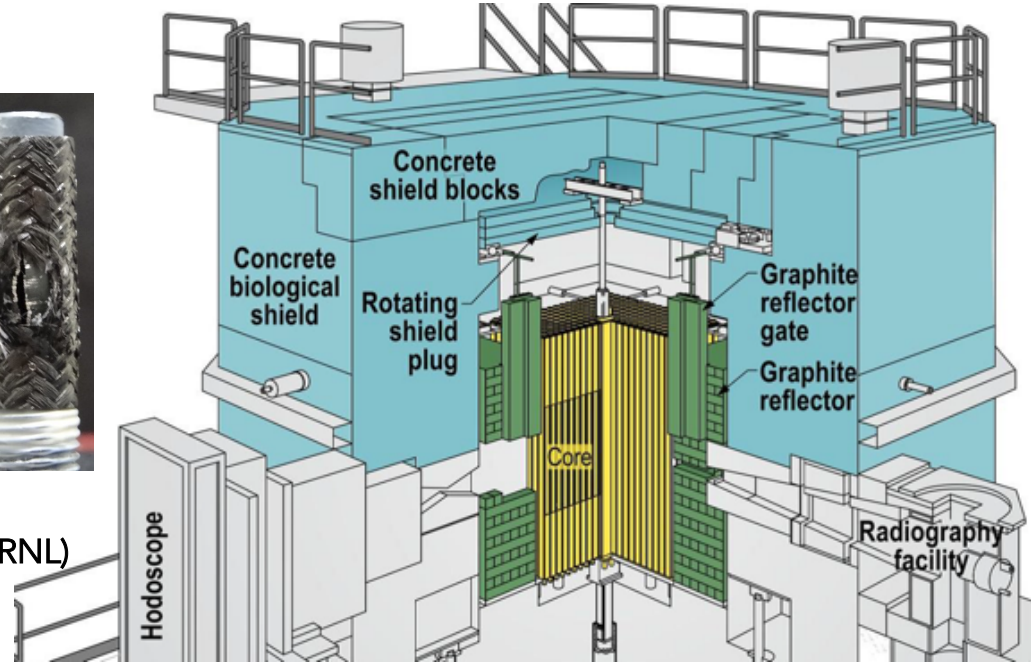
How do advanced fuel and cladding materials behave in design basis accidents and beyond?





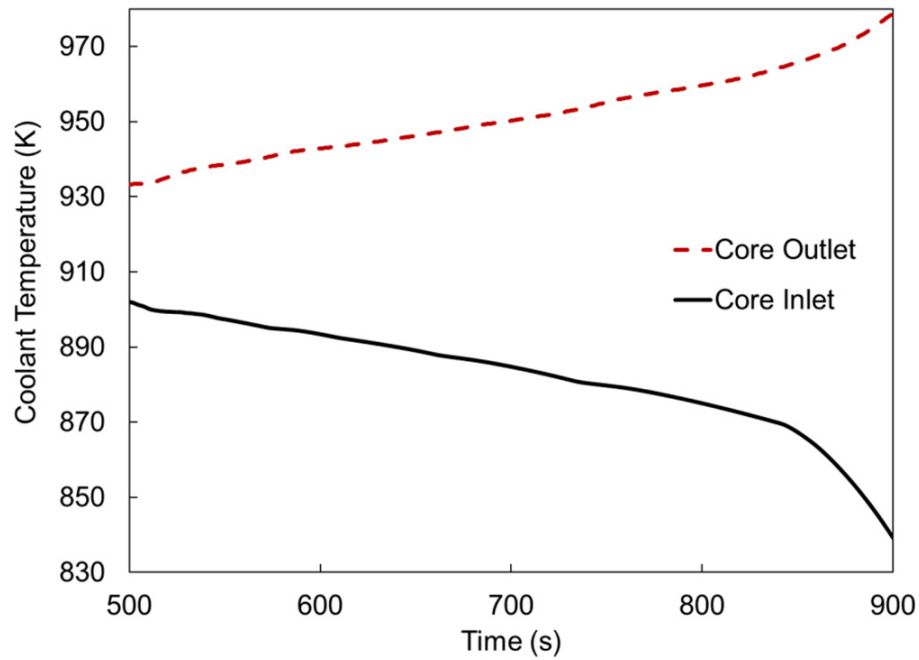
SATS and Modified Burst Test (ORNL)

TREAT Reactor (INL)

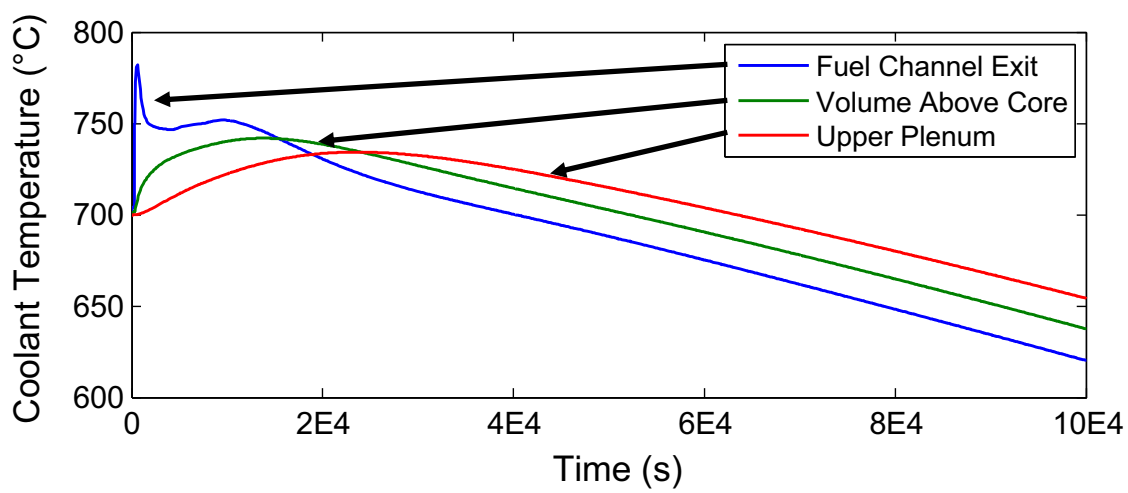


Nuclear System Analysis and Safety

- My groups studies <u>accidents and accident progression in nuclear systems</u>
  - Overpower events
  - Undercooling events



Leandro, A.M., Heidet, F., Hu, R. and Brown, N.R., 2019. *Annals of Nuclear Energy*, *126*, pp.59-67.



Brown, N.R., et al., 2017. *Annals of Nuclear Energy*, *103*, pp.49-59.