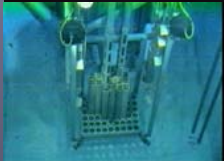
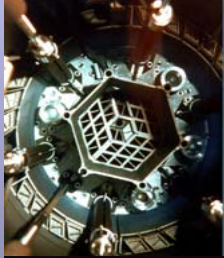


TRTR
*Education
Research
Service*

NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS



University Research Reactors: A National Asset at Risk

**A Presentation to
Robert G. Card - Under Secretary
U.S. Department of Energy
May, 8, 2003**

Representing TRTR:

Leo Bobek, University of Massachusetts-Lowell; TRTR Chairman

Ralph Butler, University of Missouri-Columbia; TRTR Chair-elect

John Bernard, Massachusetts Institute of Technology

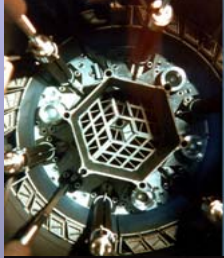
Randall Charbeneau, University of Texas

William Vernetson, University of Florida

David Wehe, University of Michigan

TRTR

**Education
Research
Service**

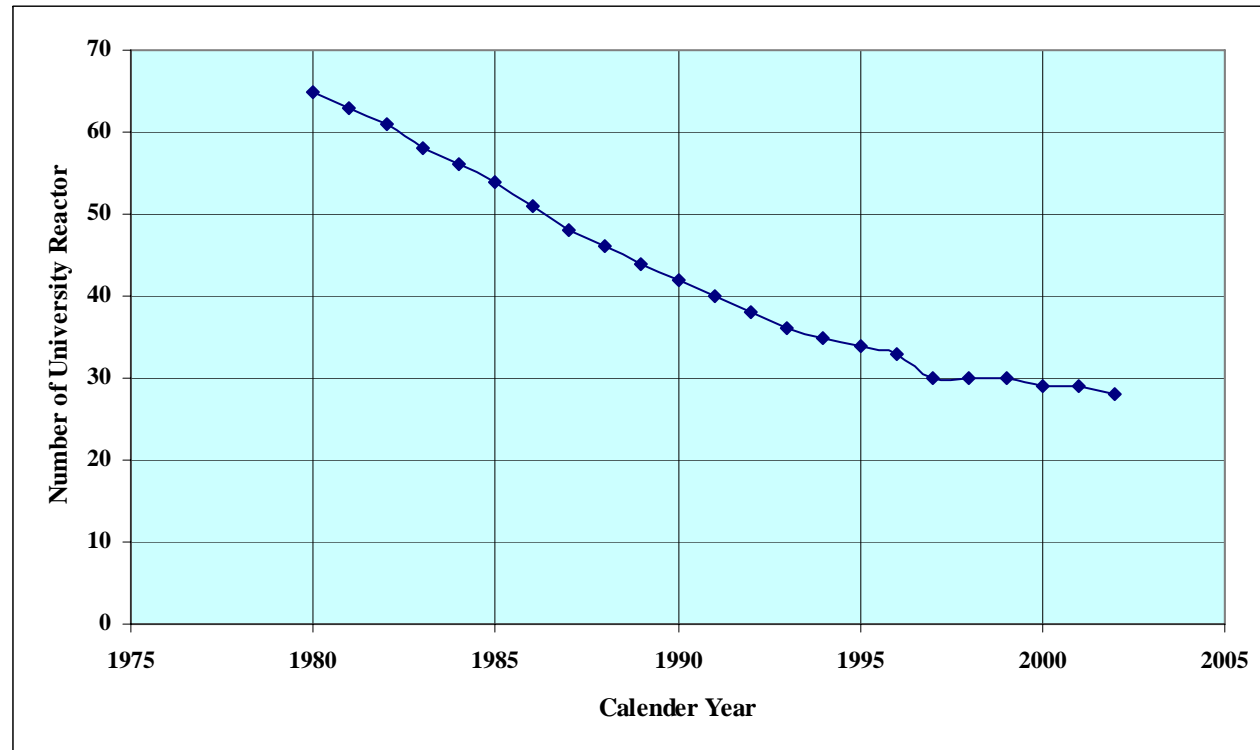


NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS

TRTR -

- a professional organization with members from nearly fifty research reactor facilities across the Nation from government, national laboratories, industry, and universities.
- promotes science and engineering education, fundamental and applied research, the application of technology in areas of national concerns, and improving U.S. technological competitiveness around the world.
- membership includes managers and directors of research reactors, administrators, educators, research scientists, engineers, and regulators.

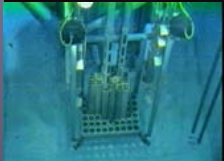
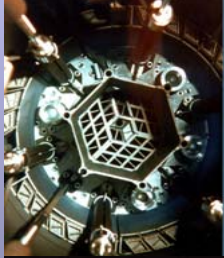
University Research Reactors- The Loss of National Assets



Adapted from: "The Future of University Nuclear Engineering Programs and University Research Reactors,"
M. L. Corradini, et al, May 10, 2000 Report to NERAC

TRTR

**Education
Research
Service**



NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS

URRs Shutdown or Decommissioned Since 1994

Facility

Power

Georgia Institute of Technology

5 MW

University of Virginia

2 MW

State Univ. of New York – Buffalo

2 MW

University of Illinois

1.5 MW

Cornell University

500 kW & 100W

Iowa State University

10 kW

Manhattan College

0.1 Watt

The Decline of URRs Correlates with NE Enrollments. However,

- After a decline for several years, NE enrollments appear to be increasing. Further increases can be expected from new nuclear power initiatives.
- Nonetheless, it is unlikely new research reactors will appear on university campuses to help educate a new generation of engineers and scientists.
- The most cost-effective and practical long-term strategy is to maintain the existing URRs by an expansion of their relatively small level of funding.



*There are 28 URRs Currently
 Serving the Nation*



<u>Facility</u>	<u>Power</u>	<u>Facility</u>	<u>Power</u>
University of Missouri-Columbia	10 MW	Ohio State University	500 kW
Massachusetts Institute of Technology	4.9 MW	Kansas State University	250 kW
University of California-Davis	2 MW	Reed College	250 kW
Rhode Island Nuclear Science Center	2 MW	University of California-Irvine	250 kW
University of Michigan	2 MW	University of Maryland	250 kW
Oregon State University	1 MW	University of Missouri-Rolla	200 kW
University of Texas, Austin	1 MW	University of Arizona	100 kW
North Carolina State University	1 MW	University of Florida	100 kW
Pennsylvania State University	1 MW	University of Utah	100 kW
Texas A&M University	1 MW & 5 W	Worcester Polytechnic Institute	10 kW
University of Massachusetts-Lowell	1 MW	Purdue University	1 kW
University of Wisconsin	1 MW	Idaho State University	5 W
Washington State University	1 MW	University Of New Mexico	5 W
		Rensselaer Polytechnic Institute	1 W

URRs at elevated risk

Each URR has a unique role in education and research

- **Some brief examples:**
 - Missouri-Columbia has a strong program in medical isotope production and research
 - MIT is currently the only U.S. reactor performing BNCT trials
 - Michigan has key programs in radiation effects research on materials
 - Texas-Austin has strong programs in neutron physics
 - Florida has a substantial nuclear science education outreach program
 - Lowell is developing a web-based reactor control room for remote outreach
 - Reed College, a liberal arts college, licenses up to 20 students/year as reactor operators



TRTR

Education
Research
Service



NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS

Why increase federal support for the existing URRs?

- URRs serve a vital national role in both educating **and** providing experience to nuclear engineers, nuclear scientists, and other professionals critical to our national labs, DOE, DOD, NRC, nuclear power, nuclear medicine, related industries, and Homeland Security.
- Many leaders in government, industry, and academia (current and past) were educated with or principal users of URRs.
 - Examples include: Nobel Laureate Shull ('94, MIT), NRC Cmmrs. Diaz (Fla.), Remick & Paladino (Penn.), DOD Asst Secy. Klein (Texas), former DOE-NE Asst. Secy. Brewer (MIT), ANS Presidents Foulke (MIT), Miller (Ohio), ANS-AAAS Congressional Fellow Kotek (Illinois)
- Hundreds, if not thousands, of Ph.D., M.S., & B.S. graduates, working at entry, mid, & upper level positions, have performed dissertations, theses, and project work, or gained invaluable “hands on” experience at URRs.

Why increase federal support for the existing URRs? (cont.)

- As we progress towards 2010 goals, URRs are the best educational outreach tool for promoting and educating the public at the grass-roots level about nuclear technologies.
- The annual cost to maintain the operating URRs is a fraction the cost of building a new research reactor.
- It is unlikely that any new URR will be built, even with a resurgence of nuclear power.



What are the Costs for Operating and Maintaining URRs?

From 2000 TRTR Data:

- Sum total URR operation and maintenance (O&M) budgets is **\$25.6M**. The sub-total of university contributions for O&M is **\$8.9M**.
- There is additional need for URR facility upgrades and new research instrumentation.
 - a 1994 DOE study showed **\$14.7M** for upgrades and **\$65.7M** for the research instrumentation.

Evolving security requirements are further increasing the URR O&M costs for universities.



URR SNF Concerns

- Interim Compensatory Measures (ICM's) promulgated by the US Nuclear Regulatory Commission require enhanced spent nuclear fuel (SNF) shipment security provisions that few, if any, universities are equipped to satisfy.
- While understandable and necessary for the protection of spent fuel shipments, none of the universities are financially capable of compliance.
- The result has been the accumulation of spent nuclear fuel on several university campuses.
- TRTR needs the help of DOE and is ready to work with DOE to resolve this national security issue.



DOE ONEST University Programs

Budget Category	FY 02	FY 03	FY04 (DOE request)
Fellowship	1.4	1.4	1.4
Nuclear Engineering Education Research	5.0	5.0	5.0
Other academic programs	1.3	1.3	1.3
Reactor fuel, instrumentation, and sharing	4.3	4.3	4.3
Innovations in Nuclear Infrastructure and Education	5.5	6.5	6.5
Total Funding (\$M)	17.5	18.5	18.5

- University Nuclear Infrastructure (UNI) Program





TRTR Recommendations:

- Increase the Innovations in Nuclear Infrastructure and Education (INIE) program funding by \$3M for a total \$9.5M in FY04.
 - This increase would progress towards the \$15M recommended in a report to NERAC (Corradini, et al, May 10, 2000) and would fully fund the awards made in 2002, while allowing additional awards in FY04.
- Enhance the University Nuclear Infrastructure (UNI) program with an additional \$2M for operation and maintenance costs.
 - The addition of a small program for O&M costs would partially offset university costs for operating URRs that are not now provided through the other DOE programs.
 - When \$3M fuel costs are factored out, the recommended O&M support combined with the existing URI and RS programs is much less than half of the university total contributions of ~\$9M.
 - **TRTR is ready to work with DOE to form a working group to assist in implementing this enhanced program.**
- TRTR is ready to establish a task group to solve the spent fuel transportation issue in cooperation with DOE.