

Facilities Subcommittee Report to NEAC

John Sackett
Washington DC
6/26/2016

NEAC Facilities Subcommittee

- Subcommittee Members: John Ahearne, Dana Christensen, Tom Cochran, Mike Corradini, Dave Hill, Hussein Khalil, Andy Klein, Paul Murray, John Sackett (chair)
- Teams visited:
 - Argonne National Laboratory
 - Hussein Khalil, Paul Murray, John Sackett
 - Idaho National Laboratory
 - Dana Christensen, Hussein Khalil, Dave Hill, John Sackett
 - Oak Ridge National Laboratory
 - Dana Christensen, Tom Cochran
- Universities were surveyed:
 - Mike Corradini, Joy Rempe, Andy Klein

University Input

University	Facility			
Michigan	Ion Beam Lab	Irradiated Materials Complex	Hi-T Corrosion Lab	Neutron Science Lab
MIT	MIT Reactor Lab	CSTAR Irradiation Facility	Materials Char. Lab	Uhlig Corrosion Lab
NC State	PULSTAR Reactor Lab			
Ohio State	OSU Reactor Lab	Hi-T Helium Test Facility	Hi-T Salt Test Facility	
Penn State	PSU Rad.Sci.Center	Intense Laser Lab	Nuclear Mat'l. Lab	Multiphase Flow Lab
RPI	RPI Gaertner LINAC	RPI Reactor Critical Facility		
Tennessee	UT Ion Beam Lab	Micro-Processing Facility	Adv.Micro. Imaging	Scintillation Mat.Res.
Wisconsin	Carbon Rad.Sci. Center	Molten Salt Test Facilities	UW Ion Beam Lab	Thermal-Hyd. Lab

Major Conclusions

- While a vibrant combination of irradiation test facilities exist (ATR/HFIR/MITR/etc.), gaps in capability are apparent
 - Transient test reactor
 - Fast spectrum reactor
 - Available hot cells
 - Coordinated availability and access
 - Validation support for modeling and simulation

Role of the Test/Demonstration Reactor

- The design, construction and operation of a test/demonstration reactor should guide the planning and prioritization of future investments in irradiation, post irradiation examination (PIE) and other facilities across the complex.
 - The test/demonstration reactor will also support enhanced efforts to sustain the human resource pool.

Reduction of Investor Risk

- A test/demonstration reactor project, should serve to reduce investor risk by early resolution of key licensing issues.
 - This is important for any technology chosen, whether a test or demonstration reactor.
 - V&V of modeling and simulation will require additional test facilities for components and systems.

Ion Beam Irradiation

- Ion-beam irradiation capabilities should be supported to confirm their relevance to neutron damage of materials in a reactor environment.
 - Capabilities exist at national labs and universities
 - Offers the potential for accelerated damage
 - To be useful, must be closely compared to actual neutron damage in reactor environments

National Scientific User Facilities

- The role of the National Scientific User Facilities (NSUF) should be expanded to enhance access and utilization of test facilities across the DOE complex.
 - The NSUF has proven to be effective in identifying, enhancing access and facilitating use of facilities
 - To enable such expansion, the processes used to designate NSUF and partner facilities should be reviewed
 - The basis for allocating funding for research support at these facilities should also be reviewed

Gaps: Transient Test Reactor

- The Transient Test Reactor (TREAT) is funded for refurbishment and restart
- The Subcommittee found that activities supporting restart are well on track
- The condition of the facility is excellent, with most systems found to be in excellent shape
- The major current task is training of personnel

Gaps: Fast Spectrum Reactor

- With the shutdown of FFTF and EBR-II, no fast-spectrum irradiation-test reactor exists in the U.S.
 - The only option is BOR-60 in Russia, currently problematic
 - Capability is useful for accelerated irradiation testing of fuel and material
- Ion-Beam irradiation is a potential substitute for accelerated testing but questions exist
 - Its relevance to in-reactor irradiation damage is unproven
 - Demonstrating its relevance is necessary if it can be reliably used as a substitute

Gaps: Available Hot Cells

- Hot Cell Operation and availability has constrained post-irradiation-examination of fuels and materials
 - The hot cells at the Idaho National Laboratory are oversubscribed and have been a constraint in irradiation testing
 - The hot cells at the Oak Ridge National Laboratory are underutilized and supported by laboratory discretionary funding
 - The hot cells for PIE at the Argonne National Laboratory are not in use

Gaps: Coordinated Availability and Use

- The National Scientific User Facilities (NSUF) has proven its effectiveness in improving awareness, access and use of partner facilities
 - Its budget is too small to have a significantly greater impact on improving coordinated availability and use of test facilities (Universities, National Laboratories, Industry, International)
 - Funding strategies for the NSUF need to be reviewed, especially considering the variety of ways in which partner facilities are funded
 - The design and construction of a new test/demonstration reactor will benefit from coordinated availability and use of test facilities

Gaps: Validation Support for Modeling and Simulation

- The emphasis is on irradiation testing of fuel and materials
 - Some effort is directed to validation
- There is a need for more test facility development in thermal-hydraulics and component testing
 - A number of test facilities exist, scattered around the complex
 - The NSUF could play a major role in identifying and coordinating their use in support of a new test/demonstration reactor
- Modeling and Simulation and associated V&V is an important area for cooperation between NE and the Office of Science

Conclusions

- DOE-NE has done an excellent job of prioritizing and maintaining essential irradiation-test facilities
 - Design and Construction of a new test/demonstration reactor will provide an opportunity to prioritize, expand and improve test capabilities across the complex
- The quality and enthusiasm of young researchers is impressive.
 - They represent considerable capability for advancing the state of nuclear technology, especially in design of a test/prototype reactor.
 - To sustain this human resource, new reactor builds are necessary.