

Nuclear Science and Engineering Lab (NSEL)

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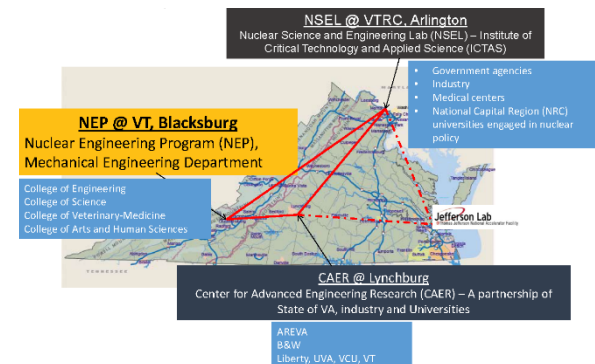
September 17, 2015

Nuclear @ VT (nuclear.ncr.vt.edu)

- In 2007, under leadership of Dean Benson and former department head of Mechanical Engineering (ME) (Prof. Ball), nuclear engineering program (NEP) was established at ME
- Hiring: Under leadership of Ken Ball, between 2011 and 2013, 1 senior and 3 junior faculty members were hired; one of the of the junior faculty members left VT in Dec 2014; trying to hire a senior faculty
- Degrees: MS and PhD degrees were approved by SCHEV in July 2013; has offered a graduate certificate since FY10
- Record of graduation: Nathan Roskoff (1st MS in Nuclear Eng), May 2014; Katherine Royston and William Walters (1st two PhD's in Nuclear Eng). May 2015; Jack Bell (1st Masters of Eng in Nuclear Eng.), May 2015
- Research activities: In collaboration with faculty from other VT department have been engaged in the following activities including power, security, medicine and policy

Nuclear Science and Engineering Lab (NSEL)

- Established in 2011 under auspices of ICTAS and support of Mechanical Engineering Department
- NSEL offers nuclear engineering education and research in the National Capital Region (NCR) in coordination with Nuclear Engineering Program (NEP); this is accomplished by
 - Offering courses, supervising graduate students, and offering workshops/forums
- NSEL is engaged in research and education in **nuclear power, nuclear safeguards and nonproliferation, radiation diagnostics and therapy, and nuclear policy**
- In addition to NEP, NSEL takes advantage of resources within Virginia and beyond



NSEL Collaborations

- **National Capital Region (NCR):** US Naval Academy (USNA), Naval Surface Warfare Center (NSWC) at Carderock, Federation of American Scientists (FAS).
 - Aug. 25, 2015 – Signed an Cooperative Research and Development Agreement (CRADA) with USNA
- **Other institutions:** Georgia Tech, Penn State, and University of Tennessee.
- **Within VT:** Department of Physics, Department of Science and Technology in Society (STS), School of Public and International Affairs (SPIA), and Hume Center.

NSEL Research – Groups at NCR

- **Virginia Tech Transport Theory Group (VT³G)** - Development of advanced hybrid particle transport methods and codes for simulation nuclear systems with application to power, security and medicine.
- **Nuclear nonproliferation, policy, and security culture** (with SPIA - School of Public and International Affairs, STS - Science and Technology in Society & FAS - Federation of American Scientists) - Establishing educational programs
- **Nuclear policy matters**
 - Organized and participate at meetings and workshops, and taskforces in collaboration with FAS, GWU's Elliot School of International Affairs, GABI (Global America Business Institute)

NSEL Research - Groups in Blacksburg

Nuclear Engineering Program

- **Multi-Flow and Thermal-hydraulics Lab (MFTL)** - reactor fluid modeling and simulation
- **Nuclear Materials Group (NMG)** – simulation of materials behavior under extreme conditions

Physics Department

- **GEM*STAR** (Green Energy Multiplier*Subcritical Technology for Alternative Reactors) **project** - design and analysis of accelerator-driven system with emphasis on conversion of WGPu
- **Center for Neutrino Physics - CHANDLER** (Carbon Hydrogen Antineutrino Detector with a Lithium Enhanced Raghavan optical Lattice) **project** – design, analysis and construction of a novel antineutrino detection system for nonproliferation and safeguards applications

Membership in nuclear non-profit organization

SUNRISE (Southeast Universities Nuclear Reactor Institute for Science and Education) non-profit organization was formed in 2007.

VNEC (Virginia Nuclear Energy Consortium) nonprofit organization was formed in Jan 2015, Prof. Haghghat is the Chairman of the Board of this organization



Nuclear Reactors Institute for Science and Education

SUNRISE*

(Southeast Universities Nuclear Reactors Institute for Science and Education)

*A 501(c)(3) nonprofit organization that operates from the support its sponsors and member organizations.

- **A consortium of universities has established SUNRISE non-profit organization in 2007:**
 - SUNRISE is a consortium of 11 universities, 4 vendors, and 2 non-profit organizations.
 - SUNRISE has signed MOUs with the two southeast national laboratories, i.e., ORNL and SRNL

- **SUNRISE is advocating a two-pronged approach for the enhancement of our nation’s nuclear workforce, research and technical support.:**
 - The technical approach addresses the need for development of a new specialized critical facility, research reactor, and supporting laboratory and administrative facilities.
 - The functional approach is the establishment of a single organization that can be utilized by government agencies and the nuclear industry to assist in providing a qualified workforce, to be engaged in nuclear-related research, and to provide technical assistance.

- **SUNRISE membership has studied and developed a concept paper for design and construction of a Low Power Critical Facility (LPCF), Dec 2010.**

- **SUNRISE leadership (led by Prof. Ali Haghghat) has been active in promoting the LPCF concept by:**
 - Organized the 2012 Symposium on Low Power Critical Facilities at the VTRC at Arlington for March 12, 2012.
 - Prepared a business plan
 - In discussion with stakeholders for fundraising for design studies and construction

MEMBERS
ACADEMIA
Clemson University
Georgia Institute of Technology
Mississippi State University
Missouri University of Science & Technology
North Carolina State University
South Carolina State University
University of Florida
University of South Carolina
University of South Carolina – Aiken
University of Tennessee
Virginia Polytechnic Institute & State University
INDUSTRY
AREVA NP
Fluor Corporation
General Atomic
Westinghouse Electric
Other Private Sector
Economic Development Partnership of Aiken and Edgefield Counties
South Carolina Universities Research and Education Foundation
SUNRISE IIAS
MOU's WITH:
Oak Ridge National Laboratory
Savannah River National Laboratory

VNEC nonprofit Organization

Virginia Nuclear Energy Consortium (VNEC) Board

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Purpose: *The VNEC is created to facilitate, encourage and advance the nuclear industry in Virginia through collaboration among industry participants, colleges and universities and not-for-profits in areas of need and interest to its members , including but not limited to: addressing workforce needs in the industry; research, innovation, and commercialization of nuclear technologies; providing information and education to the public, public officials and policy makers on issues related to the nuclear industry; and enhancing Virginia’s competitiveness in the nuclear industry both nationally and internationally.*

NSEL – Organization of Workshops/Forums

Year (date)	Title
2011 (Nov 7-11)	13 th International Workshop on Particle Transport Simulation of Nuclear Systems (http://www.cpe.vt.edu/transport)
2012 (March 11-12)	Symposium on Low Power Critical Facilities (LPCF) in collaboration with SUNRISE* (http://www.cpe.vt.edu/lpcf)
2012 (Nov 5)	Forum on Nuclear Regimes: Future Outlooks; sponsors included AREVA, ICTAS, VT-NCR, and partners included Naval Postgraduate school, Federation of American Scientists, and George Washington's Elliot College of International Affairs (http://www.ictas.vt.edu/nuclear)
2013 (Aug 7)	Seminar on nuclear power & education for a group of international reporters (at the request of Department of State) (http://nsel.ncr.vt.edu)
2014 (July 20)	a half-day workshop on "Advanced particle transport methodologies/tools for nuclear safeguards and non-proliferation," INMM 55 th Annual Meeting, Atlanta, Georgia. (In collaboration with Georgia Tech)
2014 (Sept 28)	A half-day workshop on "Hybrid particle transport methods for solving complex problems in real-time," PHYSOR 2014 International Conference, Kyoto, Japan. (In collaboration with Georgia Tech)
2014 (Dec 15-18)	MRT Methodologies for Real-Time Simulation of Nuclear Safeguards & Nonproliferation Problems,' Modeling and Simulation for Safeguards and Nonproliferation <i>Workshop ORNL.</i>
2015 (June 23-25)	1 st Workshop on Methodologies for Spent Nuclear Fuel Pool Simulations (Safety and Safeguards) (http://www.cpe.vt.edu/nuclear)

*Southeast Universities Nuclear Reactors Institute for Science and Education