Robert Salko

Curriculm Vitae

Education

2012 **Ph.D. Nuclear Engineering**, *The Pennsylvania State University*, University Park, PA.

2010 **M.S. Nuclear Engineering**, *The Pennsylvania State University*, University Park, PA.

2006 **B.S. Nuclear Engineering**, *The Pennsylvania State University*, University Park, PA.

2006 **B.S. Mechanical Engineering**, *The Pennsylvania State University*, University Park, PA.

Ph.D. thesis

title *Improvement of COBRA-TF for Modeling of PWR Cold- and Hot-Legs during Reactor Transients*

supervisors Maria Nikolova Avramova

Master thesis

title *Data Analysis and Modeling of NESTOR SSG Heated Rod Bundle Experiments using VIPRE-I for the Assessment of the Onset of Nucleate Boiling Criteria*

supervisors Lawrence Hochreiter and Maria Nikolova Avramova

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Experience

2014–current **Staff Research Scientist**, *Oak Ridge National Laboratory*, Oak Ridge, TN.

- Creation and application of a nuclear quality assurance (NQA-1) compliant program for development and maintenance of CTF
- Supported development of the state-of-the-art core simulator technology, Virtual Environment for Reactor Applications (VERA)
- Facilitated coupling of CTF to the crud chemistry code, MAMBA, for modeling of crud-induced power shift (CIPS) and crud-induced localized corrosion (CILC)
- Leveraged high-fidelity computational fluid dynamics (CFD) data for development of grid spacer heat transfer enhancement models in lower fidelity codes
- Assessment and development of CTF for modeling of BWR geometry and conditions
- Development of CTF for modeling of departure from nucleate boiling in core-scale, high-resolution pressurized water reactor (PWR) transients
- Development of CTFFuel fuel modeling capability and coupling of CTF and VERA to the NRC fuel performance software, FAST
- Extension of VERA core simulator technology to modeling of molten salt reactor designs
- Supported development of the MOOSE System Analysis Module (SAM) application for Molten Salt Reactor modeling and simulation

2013–2014 **Postdoctoral Researcher**, *Oak Ridge National Laboratory*, Oak Ridge, TN.

- Facilitated the integration of CTF into the multiphysics core simulator software, VERA developed by Consortium for Advanced Simulation of Light Water Reactors
- Performed parallelization of CTF for modeling of high-resolution nuclear reactor core models on high performance computing systems

2012–2013 **Postdoctoral Researcher**, *The Pennsylvania State University*, University Park, PA.

- Facilitated CTF's adoption into the CASL program by performing critical code optimizations
- Developed post-processing capabilities, allowing for simulation visualization
- Developed pre-processing utility for fast, user-friendly generation of CTF input files
- Authored the CTF Theory Manual

2010–2010 **Summer Intern**, *Oak Ridge National Laboratory*, Oak Ridge, TN.

- Performed study for coupling CTF with the Lattice Boltzman Method based code, FlowLaB-3D
- Study included performing a mesh size sensitivity analyses and decoupling the momentum equation solution process from CTF

2007–2007 **Summer Intern**, *Indian Point Nuclear Power Plant*, Buchanan, NY.

- Used RETRAN to model transients in Indian Point Units 2&3
- Made modifications to RETRAN plant models to improve accuracy of the steam dump system and pressurizer control system

2006–2006 **Summer Intern**, *Idaho National Laboratory*, Idaho Falls, ID.

- Aided in characterization of physical properties of different graphite types for use in the Very High Temperature Reactor (VHTR)
- Produced graphite billet cut-up diagrams for four different graphite types using Autodesk Inventor

Additional Activities

- Served as Ph.D. committee member for Xingang Zhao, "On the prediction of critical heat flux using a physics-informed machine learning-aided framework", Massachusetts Institute of Technology, 2019.

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- Served as Ph.D. committee member for Aysenur Toptan, "A Novel Approach to Improve Transient Fuel Performance Modeling in Multi-Physics Calculations", North Carolina State University, 2019.
- Served as Ph.D. committee chair for Taylor Blyth, "Development and Implementation of CFD-Informed Models for the Advanced Subchannel Code CTF", The Pennsylvania State University, 2017.

Computer skills

thermal-hydraulic software	CTF, SAM, VIPRE-01, RETRAN, COBRA-IV, COBRA-SFS
programming languages	Fortran, Python, c++
software	STAR-CCM+, LaTeX, SolidWorks, Unix/Linux environment

Honors and Awards

- Recipient of the 2021 Pennsylvania State University College of Engineering "40 Under 40" award
- Technology Commercialization Award in recognition for successful licensing of VERA to nuclear industry partners presented in December of 2020.
- Recipient of a 2016 R&D 100 award for contributions to the development of the Virtual Environment for Reactor Applications Core Simulator
- Recipient of an ORNL Significant Event Award for contributing to the computational performance improvements of Virtual Environment for Reactor Applications Core Simulator, December, 2016
- Recipient of an ORNL Significant Event Award for contribution to CASL milestone, "Qualify VERA-CS for Multi-Cycle (with Fuel Reloading) PWR Core Simulations Capability", October, 2015
- Chosen as the CASL 2014 Technical Contributor of the Year (CASL "Knight" award)

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- VERA Infrastructure, 2019
- CTF, 2018

Invited Talks

- "Two-phase Modeling Improvements in CTF in Support of Multiphysics Simulations of BWRs". The Pennsylvania State University Nuclear Engineering Department Seminar Series, September 23, 2021.
- "Advancements in Subchannel Modeling and Simulation". North Carolina State University Nuclear Engineering Department Seminar Series, September 19, 2019.
- "CTF Training". Westinghouse Electric Company, Cranberry Township, PA, July 10–12, 2019

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- "Development of a higher fidelity thermal hydraulic subchannel capability for simulation of LWRs". The Pennsylvania State University Nuclear Engineering Department Seminar Series, March 15, 2018.
- "CTF Practicum". CASL Institute, June 29, 2017.
- "CTF: A thermal-hydraulic subchannel tool for standalone and coupled simulation of LWRs". Reactor and Nuclear Systems Division Seminar, Oak Ridge National Laboratory, Oak Ridge, TN. September 21, 2016.
- "Overview of CTF Theory and Testing". NuScale Power, Corvallis, OR. March 31$^{\text{st}}$, 2014.
- "Development, Improvement, and Validation of Reactor Thermal-Hydraulic Analysis Tools". Oak Ridge National Laboratory, Oak Ridge, TN. March 1$^{\text{st}}$, 2013.
- "Sub-Channel Code Developments for High-Fidelity, Large-Scale LWR Simulations". Nuclear Engineering Seminar. The Pennsylvania State University, University Park, PA. October 25$^{\text{th}}$, 2012.

References

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[2] Aaron M Graham, Zack Taylor, Benjamin S Collins, Robert K **Salko**, and Max Poschmann. "Multiphysics Coupling Methods for Molten Salt Reactor Modeling and Simulation in VERA". In: *Nuclear Science and Engineering* (2021), pp. 1–22.

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