

Matthew A. Jessee

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Education

2008 *Doctor of Philosophy* in Nuclear Engineering - North Carolina State University

2005 *Master of Nuclear Engineering* - North Carolina State University

2003 *Bachelor of Science* in Nuclear Engineering - University of Tennessee-Knoxville

Professional Experience

Aug 2010 - Present Oak Ridge National Laboratory
R&D Staff

- Deputy Manager of the SCALE Code system since September 2015. Key responsibilities include project oversight, promotion of the SCALE code system to both external and internal sponsors and technical community, the development of the annual report, and primary editor of the SCALE Code Manual.
- Reactor Physics Methods Development Lead for the SCALE Code system. Key contributor and principle investigator for multiple NRC-sponsored research tasks in reactor physics.
- Lead code developer of the Polaris Lattice Physics Code.
- Research areas include sensitivity and uncertainty analysis and reactor physics analysis.

May 2008 - Aug 2010 Oak Ridge National Laboratory
Associate R&D Staff

- Software design manager for the SCALE Code System, including the TRITON reactor physics depletion analysis code and the TSURFER data adjustment and bias assessment code.
- Developed TSUNAMI-2D: first-in-kind production-level generalized perturbation theory calculation capability for SCALE.
- Led seed money project on the development of integrated reactor core modeling system using SCALE and the NESTLE nodal core simulator.

Aug 2003 - May 2008 North Carolina State University
Graduate Student

- Developed novel computations methods for uncertainty quantification and adaptive simulation of boiling water reactor core simulation based on uncertainties in nuclear data.
- As Naval Nuclear Propulsion Fellow, developed a 3D to 3D splice capability for the deterministic transport code PARTISN.
- As research student at Global Nuclear Fuels, developed fuel rod optimization method to determine the optimal fresh bundle designs for boiling water reactors.

Professional Activities

- American Nuclear Society Member since 2003
 - Student Member: 2003-2008
 - Professional Member: 2008+
 - Oak Ridge/Knoxville Local Division Member: 2010+
 - Member of Mathematics and Computation Division
 - Member of Reactor Physics Division
 - Program Committee Member, Reactor Physics Division: 2016
 - Membership Chair, Local ANS Division: 2010+
 - Session Chair and Peer Reviewer for several topicals and national conferences
- Reviewer
 - Nuclear Science and Engineering
 - Nuclear Technology
 - Annals of Nuclear Energy
- SCALE Software training instructor
- Participant in international expert panel for the Working Party for Reactor Safety (WPRS) for the Organization for Economic Cooperation and Development (OECD) / Nuclear Energy Agency (NEA)

Theses

- [1] Jessee, M.A. "Cross-Section Adjustment Techniques for BWR Adaptive Simulation". Ph.D. Dissertation. North Carolina State University, 2008.
- [2] Jessee, M.A. "Coupled Bundle-Core Design Using Fuel Rod Optimization for Boiling Water Reactors". M.N.E. Project. North Carolina State University, 2005.

Refereed Journal Articles

- [3] Jessee, M.A., Turinsky, P.J., Abdel-Khalik, H.S. "Many-group Cross-Section Adjustment Techniques for Boiling Water Reactor Adaptive Simulation". In: *Nuclear Science and Engineering* 169.1 (2011), pp. 40–55.
- [4] Jessee, M.A., Kropaczek, D.J. "Coupled Bundle-Core Design Using Fuel Rod Optimization for Boiling Water Reactors". In: *Nuclear Science and Engineering* 155.3 (2007), pp. 378–385.
- [5] Bang, Y., Abdel-Khalik, H.S., Jessee, M.A., Mertyurek, U. "Hybrid Reduced Order Modeling for Assembly Calculations". In: *Nuclear Engineering and Design* 295 (2015), pp. 661–666.
- [6] Williams, M.L., Ilas, G., Jessee, M.A., Rearden, B.T., Wiarda, D., Zwermann, W., Gallner, L., Klein, M., Krzykacz-Hausmann, B., Pautz, A. "A Statistical Sampling Method for Uncertainty Analysis with SCALE and XSUSA". In: *Nuclear Technology* 183.3 (2013), pp. 515–526.
- [7] Yankov, A., Collins, B., Klein, M., Jessee, M.A., Zwermann, W., Velkov, K., Pautz, A., Downar, T. "A Two-step Approach to Uncertainty Quantification of Core Simulators". In: *Science and Technology of Nuclear Installations* 2012 (2012).
- [8] Rearden, B.T., Williams, M.L., Jessee, M.A., Mueller, D.E., Wiarda, D.A. "Sensitivity and Uncertainty Analysis Capabilities and Data in SCALE". In: *Nuclear Technology* 174.2 (2011), pp. 236–288.
- [9] Abdel-Khalik, H., Turinsky, P., Jessee, M., Elkins, J., Stover, T., Iqbal, M. "Uncertainty Quantification, Sensitivity Analysis, and Data Assimilation for Nuclear Systems Simulation". In: *Nuclear Data Sheets* 109.12 (2008), pp. 2785–2790.
- [10] Abdel-Khalik, H.S., Turinsky, P.J., Jessee, M.A. "Efficient Subspace Methods-based Algorithms for Performing Sensitivity, Uncertainty, and Adaptive Simulation of Large-Scale Computational Models". In: *Nuclear Science and Engineering* 159.3 (2008), pp. 256–272.

Technical Reports

- [11] Rearden, B.T. and Jessee, M.A., Eds. *SCALE Code System*. ORNL/TM-2005/39. Version 6.2.1. Available from Radiation Safety Information Computational Center as CCC-834. Oak Ridge National Laboratory, 2016.

Full Length Topical Papers

- [12] Jessee, M.A., Wieselquist, W.A., Evans, T.M., Hamilton, S.P., Jarrell, J.J., Kim, K.S., Lefebvre, J.P., Lefebvre, R.A., Mertuyrek, U., Thompson, A.B., Williams, M.L. “Polaris: A New Two-Dimensional Lattice Physics Analysis Capability for the SCALE Code System”. In: *PHYSOR 2014 - The Role of Reactor Physics toward a Sustainable Future*. 2014.
- [13] Jessee, M.A., Williams, M.L., Dehart, M.D. “Development of Generalized Perturbation Theory Capability Within the SCALE Code Package”. In: *American Nuclear Society - International Conference on Mathematics, Computational Methods and Reactor Physics 2009, M and C 2009*. Vol. 4. 2009, pp. 2358–2368.
- [14] Jessee, M.A., Yehmert, C.E. “Interpolation Methods and Splice Options for Three-Dimensional Transport Calculations using PARTISN”. In: *Joint International Topical Meeting on Mathematics and Computations and Supercomputing in Nuclear Applications, M and C + SNA 2007*. 2007.
- [15] Jessee, M.A., Abdel-Khalik, H.S., Turinsky, P.J. “Evaluation of BWR Core Attributes Uncertainties due to Multi-Group Cross-Section Uncertainties”. In: *Joint International Topical Meeting on Mathematics and Computations and Supercomputing in Nuclear Applications, M and C + SNA 2007*. 2007.
- [16] Jessee, M.A., Kropaczek, D.J. “Coupled Bundle-Core Design Using Rod-by-Rod Optimization”. In: *Joint International Conference on Mathematics and Computation, and Supercomputing in Nuclear Applications*. 2005.
- [17] Zhou, H., Jessee, M.A., Ward, A., Downar, T. “Uncertainty Quantification for Full-Core Steady-State PWR Core Simulation with SCALE and PARCS”. In: *Physics of Reactors 2016, PHYSOR 2016: Unifying Theory and Experiments in the 21st Century*. Vol. 6. 2016, pp. 3780–3791.
- [18] Bratton, R.N., Jessee, M.A., Wieselquist, W.A., Ivanov, K.N. “ROD Internal Pressure Quantification and Distribution Analysis using FRAPCON”. In: *Physics of Reactors 2016, PHYSOR 2016: Unifying Theory and Experiments in the 21st Century*. Vol. 4. 2016, pp. 2588–2602.
- [19] Williams, M.L., Wiarda, D., Kim, K.S., Jessee, M.A. “Multigroup Data Processing for the Embedded Self-Shielding Method in SCALE”. In: *Physics of Reactors 2016, PHYSOR 2016: Unifying Theory and Experiments in the 21st Century*. Vol. 4. 2016, pp. 2176–2187.
- [20] Godfrey, A., Jessee, M., Stimpson, S., Collins, B., Evans, T., Kromar, M., Franceschini, F., Salazar, D. “VERA Benchmarking Results for Krško Nuclear Power Plant Cycle 1”. In: *Physics of Reactors 2016, PHYSOR 2016: Unifying Theory and Experiments in the 21st Century*. Vol. 6. 2016, pp. 3998–4008.
- [21] Bostelmann, F., Weiss, F.-P., Aures, A., Velkov, K., Zwermann, W., Rearden, B.T., Jessee, M.A., Williams, M.L., Wiarda, D., Wieselquist, W. “Influence of Nuclear Data on Fast Reactor Calculations”. In: *Physics of Reactors 2016, PHYSOR 2016: Unifying Theory and Experiments in the 21st Century*. Vol. 2. 2016, pp. 1040–1048.
- [22] Bostelmann, F., Weiss, F.-P., Aures, A., Velkov, K., Zwermann, W., Rearden, B.T., Jessee, M.A., Williams, M.L., Wiarda, D., Wieselquist, W.A. “Uncertainty and Sensitivity Analysis in Criticality Calculations with Perturbation Theory and Sampling”. In: *Mathematics and Computations, Supercomputing in Nuclear Applications and Monte Carlo International Conference, M and C+SNA+MC 2015*. Vol. 3. 2015, pp. 2225–2236.
- [23] Bang, Y., Abdel-Khalik, H.S., Jessee, M.A., Mertuyrek, U. “Hybrid Reduced Order Modeling for Assembly Calculations”. In: *International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, M and C 2013*. Vol. 3. 2013, pp. 2028–2039.
- [24] Yankov, A., Collins, B., Jessee, M.A., Downar, T. “A Generalized Adjoint Approach for Quantifying Reflector Assembly Discontinuity Factor Uncertainties”. In: *International Conference on the Physics of Reactors 2012, PHYSOR 2012: Advances in Reactor Physics*. Vol. 4. 2012, pp. 2781–2790.

- [25] Yankov, A., Klein, M., Jessee, M.A., Zwermann, W., Velkov, K., Pautz, A., Collins, B., Downar, T. “Comparison of XSUSA and ”Two-Step” Approaches for Full-Core Uncertainty Quantification”. In: *International Conference on the Physics of Reactors 2012, PHYSOR 2012: Advances in Reactor Physics*. Vol. 4. 2012, pp. 2791–2803.
- [26] Williams, M., Wiarda, D., Smith, H., Jessee, M.A., Rearden, B.T., Zwermann, W., Klein, M., Pautz, A., Krzykacz-Hausmann, B., Gallner, L. “Development of a Statistical Sampling Method for Uncertainty Analysis with SCALE”. In: *International Conference on the Physics of Reactors 2012, PHYSOR 2012: Advances in Reactor Physics*. Vol. 4. 2012, pp. 2804–2815.
- [27] Rearden, B.T., Petrie, L.M., Peplow, D.E., Jessee, M.A., Wiarda, D., Williams, M.L., Lefebvre, R.A., Lefebvre, J.P., Gauld, I.C., Goluoglu, S. “Enhancements in SCALE 6.1”. In: *International Conference on the Physics of Reactors 2012, PHYSOR 2012: Advances in Reactor Physics*. Vol. 3. 2012, pp. 1847–1860.

Conference Summaries

- [28] Jessee, M.A., Wieselquist, W.A., Williams, M.L., Kim, K.S. “VERA Benchmark Calculations Using the SCALE-Polaris Lattice Physics Code”. In: vol. 109. PART 2. 2013, pp. 1413–1415.
- [29] Jessee, M.A., Abdel-Khalik, H.S., Turinsky, P.J. “Cross-Section Adjustment Algorithms for Boiling Water Reactor Core Simulation”. In: vol. 99. 2008, pp. 755–757.
- [30] Jessee, M.A., Abdel-Khalik, H.S., Turinsky, P.J. “Subspace Methods for Multi-Scale/Multi-Physics Calculations, Part II: Numerical Experiments”. In: vol. 96. 2007, pp. 551–552.
- [31] Bledsoe, K.C., Favorite, J.A., Lefebvre, J.P., Lefebvre, R.A., Jessee, M.A. “Application of the Differential Evolution Adaptive Metropolis (DREAM) Method for Uncertainty Quantification in Inverse Transport Problems”. In: vol. 111. 2014, pp. 743–746.
- [32] Bledsoe, K.C., Jessee, M.A., Favorite, J.A. “Application of Generalized Linear Least-Squares for Uncertainty Quantification in Inverse Transport Problems”. In: vol. 108. 2013, pp. 445–448.
- [33] Galloway, J.D., Maldonado, G.I., Gauld, I., Jessee, M.A., Clarno, K.T. “Generalized Isotopic Tracking Capabilities within the 3-D BWR Nodal Simulator NESTLE”. In: vol. 103. 2010, pp. 748–750.
- [34] Galloway, J., Hernandez, H., Maldonado, G.I., Jessee, M., Popov, E., Clarno, K. “BWR Modeling Capability and SCALE/TRITON Lattice-to-Core Integration of the NESTLE Nodal Simulator”. In: vol. 2. 2010, pp. 1483–1495.
- [35] Maldonado, G.I., Galloway, J., Hernandez, H., Clarno, K.T., Popov, E.L., Jessee, M.A. “Integration of the NESTLE Core Simulator with SCALE”. In: vol. 100. 2009, pp. 619–620.