Benjamin S. Collins

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Summary

Dr. Benjamin S. Collins is a Research and Development (R&D) staff scientist in the Reactor Physics group at Oak Ridge National Laboratory (ORNL). He received his B.S and M.S. degrees in Nuclear Engineering from Purdue University in 2007 and 2008, respectively. He received his Ph.D. from the University of Michigan in Nuclear Engineering, Radiological Science, and Scientific Computing in 2011. After completing one year of postdoctoral study at the University of Michigan, he was promoted to faculty as a Research Scientist. In 2014, he joined ORNL as an Associate R&D staff scientist and was promoted in 2016 to his current position. He is also an Adjunct Assistant Professor at the University of Michigan where he continues to advise students doctoral research.

Since graduating in 2011, Ben has been a principle researcher and leader in CASL (the Consortium for Advanced Simulation of Light Water Reactors [LWRs]), a Department of Energy (DOE) Energy Innovation Hub. He is a leader the development of the MPACT neutron transport code and VERA (Virtual Environment for Reactor Applications) with a focus on multiphysics coupling methods for whole core reactor analyses of commercial nuclear power plants. In 2015, Ben earned the highest award for technical contributions in CASL, the CASL Knight, for innovations in modeling CRUD Induced Power Shift of the Watts Bar Nuclear Power Station. Ben was also part of the team awarded the R&D 100 award for VERA in 2016.

In addition to LWRs, Ben has become a leader in the advanced modeling of liquid-fueled molten salt reactors (MSRs). Ben was awarded an ORNL Laboratory Directed Research and Development (LDRD) grant in 2016 to extend CASL tools to model molten salt reactors. This focus includes nominal operation, operational transients, and design basis accident modeling and has been invited to present this work at international meetings.

Ben has been a member of the American Nuclear Society since 2003 and is currently serving on the Reactor Physics Program Committee. He has authored 16 journal articles, 68 conference papers, and 34 technical reports. He has also served on the committee of 10 PhD students at the Universities of Michigan and Tennessee, including 5 which he served as co-chair.

Education

University of Michigan, Ann Arbor 2008-2011

PhD in Nuclear Engineering and Radiological Sciences and Scientific Computing
Dissertation Title: Multiscale Methods for Nuclear Reactor Analysis

Purdue University, West Lafayette 2007-2008

Master of Science in Nuclear Engineering
Specialization in Computational Engineering
Thesis Title: Neutronic Modeling of a Fast Boron Injection System

Purdue University, West Lafayette 2002-2007

Bachelor of Science in Nuclear Engineering

Professional Experience

Research and Development (R&D) Staff, ORNL 2014-Present

- Software Development and Design for the Reactor Physics code MPACT
- ORNL Lead for Development and Design of the Reactor Physics code MPACT
- Co-lead for the development of the VERA Core Simulator (VERA-CS)
- Multiphysics R&D for LWRs and advanced reactors
- Physics integration for coupling with surface chemistry (MAMBA) and fuel performance (Bison)

Adjunct Assistant Professor, University of Michigan 2014-Present

- Mentor graduate students focusing on new extensions to the 2D/1D method including:
  - Improved angular resolution which captures azimuthal variation
  - Development of a new MOC informed 3D discrete ordinates solution
  - Advanced methods to capture subgrid heterogeneity
  - Development of manufatured solutions for neutron transport and problems with thermal-hydrualic feedback

Assistant Research Scientist, University of Michigan 2012-2014

- Co-Lead for the Development and Design of MPACT
- Multiphysics coupling of transport with depletion (ORIGEN) and subchannel thermal-hydraulics (CTF)
- Mentored graduate students in development of MPACT transport methods

Postdoctoral Research Fellow, University of Michigan 2011-2012

- Creator of the MPACT 2D/1D neutron transport code
- Coupling neutron transport (MPACT and DeCART) with CFD
- Mentored graduate students

Graduate Research Assistant, University of Michigan 2008-2011

- Steady State Boiling Water Thermal-Fluids Solver for the PARCS core simulator
- Coupled Multiscale Methods

Graduate Research Assistant, Purdue University 2007-2008

- Steady State Boiling Water Thermal-Fluids Solver for PARCS
- LOCA Analysis of Heavy Water Reactor

Undergraduate Research Assistant, Purdue University 2005-2007

- LOCA Analysis of Heavy Water Reactor
- Worked with CFD Codes to Model Bubble Columns

Cooperative Student, First Energy Nuclear Operating Company 2002-2006

- Reactor Engineering Co-op at Perry NPP, Davis-Besse NPS, and Beaver Valley NPS
- Core Design and Physics Support Co-op at Corporate Office
- Developed Various Computational Tools
- Assisted in Refueling Activities

Honors and Awards

- R&D 100 Award Winner – *Virtual Environment for Reactor Applications (VERA)* (2016).
- ORNL Significant Event Award - *Significant Improvement in Computational Performance of the VERA Core Simulator to Meet Industry Objectives for Adoption* (2016).
- ORNL Significant Event Award – *High-Fidelity Benchmark of the CASL Virtual Environment for Reactor Applications Against Data from the Full Operating History of TVA's Watts Bar Nuclear Power Plant* (2015).
- Consortium for Advanced Simulation of Light Water Reactors – *CASL Knight - Technical Contributor of the Year* (2015).
- Alpha Nu Sigma - Honor Society in Nuclear Engineering (2007-2011).
- National Academy for Nuclear Training Scholar (2006-2007).

Professional Memberships

American Nuclear Society 2003-Present

Reactor Physics Division (Current Program Committee Member)
Mathematics and Computation Division

Professional Service

Thesis Co-chair

University of Michigan

- Aaron Graham – Subgrid Methods for Resolving Axial Heterogeneity in Planar Synthesis Solutions for the Boltzmann Transport Equation (2017)
- Mitch Young – Orthogonal-Mesh, 3-D S_N with Embedded 2-D Method of Characteristics for Whole-Core, Pin-Resolved Reactor Analysis (2016)
- Shane Stimpson – An Azimuthal, Fourier Moment-Based Axial S_N Solver for the 2D/1D Scheme (2015)
- Artem Yankov – Analysis of Reactor Simulations Using Surrogate Models (2015)
- Jipu Wang – Method of Manufactured Solutions for Coupled Systems (Expected 2017)

University of Tennessee

- Erik Walker – Nonlinear Coupling Methods (Expected 2017)
- AJ Pawel – Multiscale Depletion Methods (Expected 2018)
- Zack Taylor – Coupled Mass Transport for Molten Salt Reactors (Expected 2019)

Thesis Committee Member

University of Michigan

- Adam Nelson – Improving Performance of Monte Carlo Scattering Moment Matrix Tallies via Continuous-Energy Data Mining (2014)
- Adam Hoffman – A Time-Dependent Method of Characteristics Formulation with Time Derivative Propagation (2013)

Intern Mentor

- Shane Stimpson, University of Michigan (2014-2015)
- Aaron Graham, University of Michigan (2014-2017)
- Jipu Wang, University of Michigan (2015)
- Xinyan Wang, University of Michigan (2015)
- Zack Taylor, University of Tennessee (2017)
- William Dawn, North Carolina State University (2017)

Journal and Conference Reviews

- Annals of Nuclear Energy
- Nuclear Engineering and Design
- Journal of Computational Physics
- Mathematics and Computation 2017
- PHYSOR 2016
- Mathematics and Computation 2015 (Reactor Physics Track Organizer)
- Mathematics and Computation 2013
- PHYSOR 2012

Publications

Author or co-author of 16 journal articles, 68 conference proceedings, and 34 technical reports.

Journal Publications

1. (in preparation) **B. Collins**, R. Salko, S. Stimpson, K. Clarno, A. Godfrey, S. Palmtag, J. Secker, B. Kendrick, R Montgomery. "Simulation of CRUD-Induced Power Shift using the VERA Core Simulator and MAMBA-1D," targeting *Annals of Nuclear Energy*.
2. (in preparation) A. Godfrey, **B. Collins**, K. Kim, J. Powers, R. Salko, S. Stimpson, W. Wieselquist, K. Clarno, J. Gehin, S. Palmtag, R. Montgomery, R. Montgomery, D. Jabaay, B. Kochunas, T. Downar, N. Capps, J. Secker. "VERA Benchmarking Results for Watts Bar Nuclear Plant Unit 1 Cycles 1-12," targeting *Progress in Nuclear Energy*.
3. (submitted) **B. Collins**, A. Godfrey, S. Stimpson, S. Palmtag. "Simulation of the BEAVRS Benchmark using VERA," targeting *Annals of Nuclear Energy*.

4. (accepted) S. Stimpson, Y. Liu, **B. Collins**, K. Clarno, "A Lumped Parameter MOC Approach and Multigroup Kernels Applied to Subgroup Self-Shielding in MPACT," *Nuclear Engineering and Technology* [Invited].

5. (accepted) D. Kelly, A. Kelley, B. Aviles, A. Godfrey, R. Salko, **B. Collins**. "MC21 / CTF and VERA Multiphysics Solutions to VERA Core Physics Benchmark Progression Problems 6 and 7," *Nuclear Engineering and Technology* [Invited].

6. (in press) B. Aviles, D. Kelly, D. Aumiller, D. Gill, B. Siebert, A. Godfrey, **B. Collins**, R. Salko. "MC21 / COBRA-IE and MPACT / CTF Multiphysics Solution to VERA Core Physics Benchmark Problem #6, *Progress in Nuclear Energy* (June 2017).

7. S. Stimpson, **B. Collins**, B. Kochunas. "Improvement of Transport-Corrected Scattering Stability and Performance Using a Jacobi Inscatter Algorithm for 2D-MOC," *Annals of Nuclear Energy*, **105**, pp. 1-10 (2017).

8. S. Stimpson, **B. Collins**, T. Downar. "A 2-D/1-D Transverse Leakage Approximation based on Azimuthal, Fourier Moments," *Nuclear Science and Engineering*, **185**, 2, pp. 243-262 (2017).

9. B. Kochunas, **B. Collins**, S. Stimpson, R. Salko, D. Jabaay, A. Graham, Y. Liu, K. S. Kim, W. Wieselquist, A. Godfrey, K. Clarno, S. Palmtag, T. Downar, J. Gehin. "VERA Core Simulator Methodology for PWR Cycle Depletion," *Nuclear Science and Engineering*, **185**, 1, pp. 217-231 (2017) [Invited].

10. **B. Collins**, S. Stimpson, B. W. Kelley, M. T. H. Young, B. Kochunas, E. W. Larsen, T. Downar, A. Godfrey. "Stability and Accuracy of 3D Neutron Transport Simulations Using the 2D/1D Method in MPACT," *Journal of Computational Physics*, **326**, pp. 612-628 (2016).

11. J. Turner, K. Clarno, M. Sieger, R. Bartlett, **B. Collins**, R Pawlowski, R. Schmidt, R. Summers. "The Virtual Environment for Reactor Applications (VERA): Design and Architecture, *Journal of Computational Physics*, **326** pp.544-568 (2016).

12. Z. Liu, **B. Collins**, B. Kochunas, Y. Xu, T Downar, H. Wu. "Model and Analysis of Performance for the Method of Characteristics Direction Probabilities with Boundary Averaging," *Progress in Nuclear Energy*, **80** pp.110-118 (2015).

13. D. Walter, B. Kendrick , V. Petrov, A. Manera, **B. Collins**, T Downar. "Proof-of-Principle of High-Fidelity Coupled CRUD Deposition and Cycle Depletion Simulation," *Annals of Nuclear Energy*, **85** pp.1152-1166 (2015).

14. M. Hursin, **B. Collins**, Y. Xu, T. Downar. "The Development and Implementation of a 1-D S_N Method in the 2D-1D Integral Transport Solution," *Nuclear Science and Engineering*, **176** pp.186-200 (2013).

15. A. Yankov, **B. Collins**, M. Klein, M. Jessee, W. Zwermann, K. Velkov, A. Pautz, T. Downar. "A Two-Step Approach to Uncertainty Quantification of Core Simulators," *Science and Technology of Nuclear Installations*, **2012**, Article ID 767096 (2012).

16. A. Ward, **B. Collins**, M. Madariaga, Y. Xu, T. Downar. "Methods & Model Development for Coupled RELAP5 / PARCS Analysis of the Atucha-II Nuclear Power Plant." *Science and Technology of Nuclear Installations*, **2011**, Article ID 759847 (2011).

Refereed Conference Proceedings

1. (submitted) C. Gentry, B. Betzler, **B. Collins**. "Initial Benchmarking of ChemTriton and MPACT MSR Modeling Capabilities," *Trans. Am. Nucl. Soc.*, (2017).

2. (accepted) V. de Almeida, **B. Collins**, R. Salko, R. Taylor. "Modeling Xenon Transport in Molten Salt Fueled Reactors," *AIChE Annual Meeting Proceedings*, (2017).

3. (submitted) J. Powers, S. Stimpson, K. Clarno, A. Godfrey, R. Pawlowski, **B. Collins**, A. Toth. "Comparison and Demontration of Fully Coupled Multiphysics Simulations for Watts Bar Unit 1," *Proc. WRFPM 2017*, Jeju, Korea (September 10-14, 2017).

4. **B. Collins**, C. Gentry, A. Wysocki, R. Salko. "Molten Salt Reactor Simulations using MPACT-CTF," *Trans. Am. Nucl. Soc.*, **116**, pp. 1170-1173 (2017).

5. S. Stimpson, **B. Collins**. "Flexible Spatial Partitions in MPACT Through Module-Based Data Passing," *Trans. Am. Nucl. Soc.*, **116**, pp. 654-657 (2017).

6. J. Wang, W. Martin, **B. Collins**. "Verification of a Multiphysics Code with Method of Manufactured Solutions," *Trans. Am. Nucl. Soc.*, **116**, pp. 1116-1119 (2017).

7. **B. Collins**, S. Hamilton, S. Stimpson. "Use of Generalized Davidson Eigenvalue Solver for Coarse Mesh Finite Difference Acceleration," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

8. **B. Collins**, A. Godfrey, S. Stimpson, S. Palmtag. "Simulation of BEAVRS Benchmark Using VERA," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

9. **B. Collins**, C. Gentry, S. Stimpson. "Molten Salt Reactor Simulations Using VERA-CS," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

10. S. Stimpson, **B. Collins**, A. Godfrey, F. Franceschini, D. Salazar. "Extended Radial Reflector Modelling Capabilities in MPACT," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

11. A. Godfrey, **B. Collins**, C. Gentry, J. Ritchie. "Analysis of the Startup of Watts Bar Nuclear Unit 2 using VERA," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

12. M. Young, **B. Collins**, W. Martin. "2D/3D Reactor Analysis using Orthogonal-Mesh S_N with Embedded 2-D Method of Characteristics," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

13. A. Graham, **B. Collins**, T. Downar. "Subplane-based Control Rod Decusping Techniques for the 2D/1D Method in MPACT," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

14. A. Graham, **B. Collins**, T. Downar. "Improvement of the 2D/1D Method in MPACT Using the Subplane Scheme," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

15. E. Walker, **B. Collins**, J. Gehin. "Jacobian-Free Newton-Krylov Coupling Methods for Nuclear Reactors," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

16. S. Stimpson, Y. Liu, **B. Collins**, K. Clarno. "A Multigroup, Lumped Parameter MOC Method for Subgroup Self-Shielding in MPACT," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

17. R. Salko, A. Wysocki, **B. Collins**, M. Avamova, C. Gosdin. "Development and Assessment of CTF for Pin-Resolved BWR Modeling," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

18. J. Wang, W. Martin, **B. Collins**. "Order of Accuracy of Spatial Discretization of Method of Characteristics," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

19. D. Kelley, A. Kelley, B. Aviles, A. Godfrey, R. Salko, **B. Collins**. "MC21 / CTF and VERA Multiphysics Solutions to VERA Core Physics Benchmark Progression Problems 6 and 7," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).

20. S. Stimpson, **B. Collins**. "Implementation of a Red-Black SOR CMFD Solver in MPACT," *Trans. Am. Nucl. Soc.*, **115**, pp. 1252-1255 (2016).

21. R. Salko, S. Palmtag, **B. Collins**. "CTF Parallel Performance Improvements," *Trans. Am. Nucl. Soc.*, **115**, pp. 1601-1604 (2016).

22. Y. Liu, S. Stimpson, K. S. Kim, **B. Collins**, B. Kochunas. "Performance Improvements to the Cross Section Calculation in MPACT," *Trans. Am. Nucl. Soc.*, **115**, pp. 539-542 (2016).

23. **B. Collins**, R. Salko, S. Stimpson, K. Clarno, A. Godfrey, S. Palmtag, J. Secker, B. Kendrick. "Simulation of CRUD Induced Power Shift Using the VERA Core Simulator and MAMBA," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

24. A. Godfrey, **B. Collins**, K.S. Kim, R. Lee, J. Powers, R. Salko, S. Stimpson, W. Wieselquist, R. Montgomery, R. Montgomery, B. Kochunas, D. Jabaay, N. Capps, J. Secker. "VERA Benchmarking Results for Watts Bar Nuclear Plant Unit 1 Cycles 1-12," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

25. S. Stimpson, **B. Collins**, A. Zhu, Y. Xu. "A Hybrid P_3/SP_3 Axial Transport Solver for the MPACT 2D/1D Scheme," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

26. A. Graham, **B. Collins**, R. Salko, S. Palmtag, T. Downar. "Assessment of Thermal Hydraulic Feedback Models," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

27. J. Wang, W. Martin, **B. Collins**. "Application of the Method of Manufactured Solutions to the 1D S_N Equation," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

28. T. Downar, B. Kochuans, **B. Collins**. "Validation and Verification of the MPACT Code," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

29. A. Godfrey, M. Jessee, S. Stimpson, **B. Collins**, T. Evans, F. Franceschini, D. Salazar, M. Kromar. "VERA Benchmarking Results for KRŠKO Nuclear Power Plant Cycle 1," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

30. F. Franceschini, D. Salazar, A. Petrarca, A.T. Godfrey, S. G. Stimpson, C. A. Gentry, T. Evans, **B. Collins**. "AP1000® PWR Cycle 1 HFP Depletion Simulations With VERA-CS," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

31. B. Aviles, D. Kelly, D. Aumiller, D. Gill, B. Siebert, A. Godfrey, **B. Collins**, R. Salko. "Coupled MC21 and COBRA-IE Solution to VERA Core Physics Benchmark Problem #6," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).

32. B. Kochunas, D. Jabaay, T. Downar, **B. Collins**, S. Stimpson, A. Godfrey, J. Gehin, S. Palmtag, F. Franceschini. "Validation and Application of the 3D Neutron Transport MPACT Code within CASL VERA-CS," *Proc. NURETH-16*, Chicago, Illinois, USA (August 30 - September 4, 2016).

33. **B. Collins**, A. Godfrey. "Analysis of the BEAVRS Benchmark using VERA-CS," *Proc. M&C 2015*, Nashville, Tennessee, USA (April 19-23, 2015).

34. B. Kochunas, **B. Collins**, D. Jabaay, S. Stimpson, A. Graham, K. S. Kim, W. Wieselquist, K. Clarno, A. Godfrey, S. Palmtag, T. Downar, J. Gehin. "VERA Core Simulator Methodology for PWR Cycle Depletion," *Proc. M&C 2015*, Nashville, Tennessee, USA (April 19-23, 2015).

35. S. Stimpson, **B. Collins**, T. Downar. "An Azimuthal, Fourier Moment-Based Transverse Leakage Approximation for the MPACT 2D/1D Method," *Proc. M&C 2015*, Nashville, Tennessee, USA (April 19-23, 2015).

36. S. Stimpson, F. Franceschini, **B. Collins**, A. Godfrey, K. S. Kim, A. Graham, T. Downar. "Improved Diffusion Coefficients for SP_N Axial Solvers in the MPACT 2D/1D Method Applied to the AP1000® PWR Start-Up Core Models," *Proc. M&C 2015*, Nashville, Tennessee, USA (April 19-23, 2015).

37. K. Clarno, R. Pawlowski, R. Montgomery, T. Evans, **B. Collins**, B. Kochunas, D. Gaston, J. Turner. "High-Fidelity Modelling of Pellet Clad Interaction Using the CASL Virtual Environment for Reactor Applications," *Proc. M&C 2015*, Nashville, Tennessee, USA (April 19-23, 2015).

38. F. Franceschini, A. Godfrey, S. Stimpson, T. Evans, **B. Collins**, J. C. Gehin, J. Turner, A. Graham, T. Downar. "AP1000® PWR Startup Core Modeling and Simulation with VERA-CS," *Proc. ANFM 2015*, Hilton Head Island, South Carolina, USA (March 29 - April 1, 2015).

39. **B. Collins**, S. Stimpson, B. Kochunas, T. Downar. "Assessment of the 2D/1D Implementation in MPACT," *Proc. PHYSOR 2014*, Kyoto, Japan (September 28 - October 3, 2014).

40. M. Young, **B. Collins**, W. Martin. "2-D/3-D Coupling Between the Method of Characteristics and Discrete Ordinates," *Proc. PHYSOR 2014*, Kyoto, Japan (September 28 - October 3, 2014).

41. S. Stimpson, **B. Collins**, B. Kochunas, T. Downar. "Boundary Acceleration Techniques for CMFD-Accelerated 2D-MOC," *Proc. PHYSOR 2014*, Kyoto, Japan (September 28 - October 3, 2014).

42. S. Stimpson, **B. Collins**, T. Downar. "Axial Transport Solvers for the 2D/1D Scheme in MPACT," *Proc. PHYSOR 2014*, Kyoto, Japan (September 28 - October 3, 2014).

43. A. Zhu, **B. Collins**, B. Kochunas, T. Downar. "Assessment of Depletion Capability in MPACT," *Proc. PHYSOR 2014*, Kyoto, Japan (September 28 - October 3, 2014).

44. M. Young, **B. Collins**, W. Martin. "2-D/3-D Coupling Between the Method of Characteristics and Discrete Ordinates," *Trans. Am. Nucl. Soc.*, **109**, pp. 699-702 (2013).

45. **B. Collins**, B. Kochunas, D. Jabaay, T. Downar, W. Martin. "Verification of MPACT: Michigan Parallel Characteristics Transport Code," *Trans. Am. Nucl. Soc.*, **108**, pp. 795-798 (2013).

46. Z. Liu, H. Wu, B. Kochunas, **B. Collins**, Y. Xu, T. Downar. "The Method of Characteristics Direction Probabilities and its Accuracy and Performance Models." *Science and Technology on Reactor System Design Technology Laboratory Annual Meeting.* (2013).

47. B. Kendrick, V. Petrov D. Walter, A. Manera, **B. Collins**, T. Downar, J. Seker, K. Belcourt. "CASL Multiphysics Modeling Of PWR CRUD," *Proceedings of the 2013 LWR Fuel Performance Meeting* (2013).

48. D. Walter, **B. Collins**, V. Petrov, B. Kendrick, A. Manera, T. Downar. "High-Fidelity Simulation of CRUD Deposition on a PWR Fuel Pin with Grid Spacers: A Proof-of-principle using the Fully-Coupled MAMBA/DeCART/STAR-CCM+ Code." *Proc. NURETH-15*, Pisa, Italy (May 12-17, 2013).

49. *B. Collins*, B. Kochunas, T. Downar, W. Martin. "Assessment of 2D MOC Capability in MPACT," *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

50. B. Kelley, **B. Collins**, E. Larsen. "2D/1D approximations to the 3D neutron transport equation. II: Numerical comparisons," *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

51. B. Kochunas, **B. Collins**, T. Downar, W. Martin. "Overview of Development and Design of MPACT," *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

52. Y. Liu, **B. Collins**, B. Kochunas, W. Martin, K.S. Kim, M. Williams. "Resonance Self-shielding Methodology in MPACT," *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

53. S. Stimpson, M. Young, **B. Collins**, B. Kelley, T. Downar. "Assessment and Improvement of the 2D/1D Method Stability in DeCART, *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

54. B. Kochunas, S. Stimpson, **B. Collins**, T. Downar. "Coupled Neutron Transport/CFD Simulation of Whole-Core Pressurized Water Reactors, *Proc. PHYSOR 2012*, Knoxville, Tennessee, USA (April 15-20, 2012).

55. Z. Liu, B. Kochunas, **B. Collins**, T. Downar, H. Wang. "The Method of Modular Characteristic Direction Probabilities in MPACT," *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

56. F. Gleicher, M. Rose, B. Spencer, S. Novascone, R. Williamson, R. Martineau, **B. Collins**, T. Downar. "Coupling the Core Analysis Program DeCART to the Fuel Performance Application BISON," *Proc. M&C 2013*, Sun Valley, Idaho, USA (May 5-9, 2013).

57. **B. Collins**, Y. Xu, V. Seker, T. Downar. "Post-refinement Multiscale Method for Pin Power Reconstruction, *Proc. PHYSOR 2012*, Knoxville, Tennessee, USA (April 15-20, 2012).

58. B. Kochunas, **S. Stimpson**, B. Collins, T. Downar. "Coupled Neutron Transport/CFD Simulation of Whole-Core Pressurized Water Reactors, *Proc. PHYSOR 2012*, Knoxville, Tennessee, USA (April 15-20, 2012).

59. A. Yankov, **B. Collins**, M. Jessee, T. Downar. "A Generalized Adjoint Approach for Quantifying Reflector Assembly Discontinuity Factor Uncertainties, *Proc. PHYSOR 2012*, Knoxville, Tennessee, USA (April 15-20, 2012). [Best Student Paper]

60. A. Yankov, M. Klein, M. Jessee, W. Zwermann, K. Velkov, A. Pautz, **B. Collins**, T. Downar. "A Two-Step Approach to Uncertainty Quantification of Core Simulators, *Proc. PHYSOR 2012*, Knoxville, Tennessee, USA (April 15-20, 2012).

61. **B. Collins**, L. Li, D. Wang, S. Stimpson, D. Jabaay, A. Ward, Y. Xu, T. Downar. "PATHS: A Steady State Two-Phase Thermal Hydraulic Solver for PARCS Depletion, *Proc. NURETH-14*, Toronto, Canada (September 25-30, 2011).

62. **B. Collins**. "Multi-scale Neutronic Methods for Analyzing the Prismatic HTGR," *ANS Student Conference*, Ann Arbor, MI (2010).

63. **B. Collins**. "PATHS: An Advanced Steady State Thermal Hydraulic Solver for PARCS," *ANS Student Conference*, Ann Arbor, MI (2010).

64. **B. Collins**, V. Seker, T. Downar. "Neutronic Multi-scale Analysis of the Prismatic HTGR," *High Temperature Reactor Technology*, Prague, Czech Republic (October 18-20, 2010).

65. **B. Collins**, A. Ward, Y. Xu, T. Downar. "Nodal Expansion Method with Axially Varying Cross-sections," *Proc. PHYSOR 2010*, Pittsburgh, Pennsylvania, USA (May 9-14, 2010).

66. A. Ward, V. Seker, **B. Collins**, T. Downar. "Thorium Fuel Utilization in the BWR: Lattice Physics Analysis of Reactivity Coefficients," *Proc. PHYSOR 2010*, Pittsburgh, Pennsylvania, USA (May 9-14, 2010).

67. **B. Collins**, A. Ward, B. Mount, T. Drzewiecki, Y. Xu, T. Downar, M. Bertodano. "Modeling of the Fast Boron Injection System for CNA-II," *Proc. PHYSOR 2008*, Interlaken, Switzerland (September 14-19, 2008).

68. A. Ward, **B. Collins**, M. Madariaga, Y. Xu, T. Downar. "The Application of the PARCS Neutronics Code to the Atucha-I & Atucha-II Nuclear Power Plants," *Proc. PHYSOR 2008*, Interlaken, Switzerland (September 14-19, 2008).

Technical Reports

1. S. Stimpson, K Clarno, J. Powers, **B. Collins**, R. Pawlowski, A. Toth. "Demonstration of Coupled Tiamat Single Assembly Calculations," CASL-U-2017-1357-000, Oak Ridge National Laboratory (June 16, 2017).

2. T. Pandya, T. Evans, K. Clarno, **B. Collins**. "Excore Radiation Transport Modeling with VERA," CASL-U-2017-1311-000, Oak Ridge National Laboratory (April 28, 2017).

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