Kaushik Banerjee

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Summary

Ph.D. Nuclear Engineer with experience developing and applying mathematical and computational methods for radiation shielding, criticality safety, and reactor analyses with particular expertise in Monte Carlo radiation transport and burnup credit criticality safety analyses for the spent fuel storage and transportation.

Education

- University of Michigan: **Ph.D.**, Nuclear Engineering and Radiological Sciences, 2005 – 2009
- Kansas State University: **M.S.**, Nuclear Engineering, 2003 – 2005
- Bengal Engineering College, Shibpore, India: **B.E.**, Metallurgical Engineering, 1997 – 2001

Appointments

- October 2013 – Present: **R&D Staff, Used Fuel Systems**, Oak Ridge National Laboratory
  Supervisor: John M. Scaglione, Dr. John C. Wagner (former)
  March 2013 – September 2013: **R&D Staff, Radiation Transport**, Oak Ridge National Laboratory
  Supervisor: Dr. Robert E. Grove
  Responsibilities:
  1. Provide R&D support to the Department of Energy (DOE) nuclear fuel storage and transportation project (NFST) and used fuel disposition (UFD) project
     - UNF-ST&DARDS: Leading the technical development of a comprehensive, integrated data and analysis tool—the Used Nuclear Fuel-Storage, Transportation & Disposal Analysis Resource and Data System (UNF-ST&DARDS). UNF-ST&DARDS currently supports used nuclear fuel cask-specific as-loaded safety analysis including criticality, thermal and dose evaluations, as well as results visualization.
     - Direct disposal of dual-purpose canisters: Leading the R&D effort to assess the post-closure criticality safety of dual-purpose canisters.

- December 2012 – March 2013: **Principal Nuclear Engineer**, Holtec International, Marlton, NJ
  January 2010 – December 2012: **Senior Nuclear Engineer**, Holtec International, Marlton, NJ
  Supervisor: Dr. Stefan Anton
  Responsibilities:
  1. Shielding analyses of dry spent fuel storage, transfer and transport casks
     - **First point of contact** and **Subject Matter Expert** for all shielding related analyses at Holtec International.
     - Performed and reviewed shielding analyses using SAS2H, ORIGEN-S and MCNP for Holtec International's HI-STORM and HI-STAR systems.
     - Lead author of shielding chapters for the HI-STORM FSAR and HI-STAR SAR and any other licensing documents.
     - Lead investigator for the HI-STORM, HI-STORM UMAX and HI-STAR design optimization to reduce dose rates.
     - Assisted in preparing proposals, including research and development of new dry storage cask design.
  2. Containment analyses of dry spent fuel transportation cask
  3. Criticality safety analyses for dry and wet spent fuel storage with burnup credit application, using MCNP/CASMO and SAS2/ORIGEN-ARP/KENO (utilizing STARBUCS module). One of the authors of Criticality chapters for all Holtec International's licensing applications
  4. Criticality benchmarking and validation of the MCNP code
  5. Depletion uncertainty analyses
  6. Involved in Holtec International's **Small Modular Reactor (SMR)** project
  7. Validation and maintenance of all Holtec approved Nuclear Engineering computer programs
- 2005 – 2009: **Graduate Student Research Assistant**, University of Michigan, Ann Arbor, MI
  Advisor: Dr. William R. Martin
  Projects:
  1. Acceleration of Monte Carlo fission source convergence with the Kernel Density Estimator
  2. Higher order Monte Carlo tallies using the Kernel Density Estimator
  3. Unbounded variance estimation of Monte Carlo point detector and surface crossing flux tallies
  4. Coupled Nuclear-Thermal-Hydraulic calculations for VHTR
- 2003 – 2005: **Graduate Student Research Assistant**, Kansas State University, Manhattan, KS
  Advisor: Dr. William L. Dunn
  Projects:
  1. Detection of Subsurface Defects Using X-ray Scanning
  2. Remote Detection of Conventional Explosive Materials

- 2002 – 2003: **Technical Marketing Engineer**, Electrosteel Castings Limited, Calcutta, India
  Responsibility:
  1. Engineering design of potable and storm water system

Dissertations

1. **Ph.D. Dissertation:** "Kernel Density Estimator Methods for Monte Carlo Radiation Transport" – advised by Dr. William R. Martin, University of Michigan, Ann Arbor, MI (December 2009).
2. **M.S. Dissertation:** "Determination of Subsurface Defects Using X-ray Scanning" – advised by Dr. William L. Dunn, Kansas State University, Manhattan, Kansas (August 2005).

Refereed Journal Articles

1. **K. Banerjee**, K.R. Robb, G. Radulescu, J.M. Scaglione, J.B. Clarity, and R.A. LeFebvre, "Cask-Specific Nuclear Safety Analyses of Loaded Spent Nuclear Fuel Casks," (Accepted, Nuclear Technology).
2. **K. Banerjee**, and W. R. Martin, "Kernel Density Estimation Method for Monte Carlo Point Detector and Surface Crossing Flux Tallies," *Nuclear Science and Engineering,* **174**, 30-45 (2013).
3. **K. Banerjee**, and W. R. Martin, "Kernel Density Estimation Method for Monte Carlo Global Flux Tallies," *Nuclear Science and Engineering,* **170**, 234-250 (2012).
4. **K. Banerjee,** and W. L. Dunn, "On X-ray Back-Scattering to Detect Hidden Cracks in Multi-Layer Structures," *Applied Radiation and Isotopes*, **65**, 176-182 (2007).
5. W. L. Dunn, **K. Banerjee**, A. Allen, and J. van Meter, "Feasibility of a Method to Identify Targets That Are Likely to Contain Conventional Explosives," *Nuclear Instruments and Methods in Physics Research B*, **263**, 179-182 (2007).

Conference Papers

1. S.P. Hamilton, G.G. Davidson, T.M. Evans, and **K. Banerjee**, "Accelerated Monte Carlo Fission Source Convergence with Fission Matrix and kernel Density Estimators," American Nuclear Society (ANS) Annual Conference, June 2016 (Accepted for publication in the ANS transaction).
2. **K. Banerjee**, J.M. Scaglione, and J.C. Wagner, "A proposed Spent Nuclear Fuel Storage and Transportation Licensing Approach Using As-loaded Analysis," *Trans. Am. Nucl. Soc.* **113**, 257-271, Washington, DC (November 2015).
3. J.B. Clarity, **K. Banerjee**, and J.M. Scaglione, "A Methodology for Fuel Assembly Design Characterization," *Trans. Am. Nucl. Soc.* **113**, 294-297, Washington, DC (November 2015).
4. G. Radulescu, R.A. Lefebvre, P.L. Miller, A.B. Thompson, **K. Banerjee**, and J.M. Scaglione, "Containment Analysis Capability of UNF-ST&DARDS," *Trans. Am. Nucl. Soc.* **113**, 269-272, Washington, DC (November 2015).

5. G. Radulescu, R.A. Lefebvre, **K. Banerjee**, P.L. Miller, and J.M. Scaglione, "Shielding Analysis Capability of UNF-ST&DARDS," *Trans. Am. Nucl. Soc.* **113**, 262-264, Washington, DC (November 2015).
6. **K. Banerjee** and J.M. Scaglione, "Criticality Safety Analysis of As-loaded Spent Nuclear Fuel Casks," Proceedings for International Conference on Nuclear Criticality Safety, September 2015, Charlotte, NC.
7. J.M. Scaglione, R.A. Lefebvre, **K. Banerjee**, G. Radulescu, and K.R. Robb, "A Unified Spent Nuclear Fuel Database and Analysis System," Proceedings for International Conference on Management of Spent Fuel from Nuclear Power Reactors, June 2015, Vienna, Austria.
8. **K. Banerjee,** J.M. Scaglione, J.C. Wagner, and R.A. LeFebvre, "Criticality Safety Assessment for As-Loaded Spent Fuel Storage and Transportation Casks," The Workshop on Operational and Regulatory Aspects of Criticality safety, May 19-21 2015, Albuquerque, NM.
9. J.M. Scaglione, J.C. Wagner, and **K. Banerjee,** "A Potential New Approach to Demonstrating Criticality Safety of Spent Fuel Storage and Transportation Casks," The Workshop on Operational and Regulatory Aspects of Criticality safety, May 19-21 2015, Albuquerque, NM.
10. **K. Banerjee,** J.M. Scaglione, and J.B. Clarity, "Subcriticality Demonstration Options for Direct Disposal of Dual-Purpose Canisters," The Workshop on Operational and Regulatory Aspects of Criticality safety, May 19-21 2015, Albuquerque, NM.
11. R.T. Jubin, **K. Banerjee,** and T. Severynse, "Evaluation of Filler Materials to Control Post-closure Criticality of Dual Purpose Canisters," International High-Level Radioactive Waste Management Conference, April 12-16, 2015, Charleston, SC.
12. E.L. Hardin, E. Kalinina, R. Howard, **K. Banerjee**, and, J.M. Scaglione, "A Case for Direct Disposal of SNF in Existing DPCs," International High-Level Radioactive Waste Management Conference, April 12-16, 2015, Charleston, SC.
13. **K. Banerjee,** J.M. Scaglione, and J.B. Clarity, "Disposability of Loaded U.S. Dual-Purpose Canisters from a Criticality Standpoint," International High-Level Radioactive Waste Management Conference, April 12-16, 2015, Charleston, SC.
14. E.L. Hardin, **K. Banerjee**, J. Carter, R. Clark, R. Howard, E. Kalinina, and J.M. Scaglione, "Investigation of Dual-Purpose Canister Direct Disposal Feasibility," 2015 WM Symposia, Phoenix, Arizona (14^{th}-19^{th} March, 2015).
15. **K. Banerjee**, J.M. Scaglione, R.A. LeFebvre, G. Radulescu, and K.R. Robb, "Streamlining Analysis Capabilities for Used Nuclear Fuel Management," 2015 WM Symposia, Phoenix, Arizona (14^{th}-19^{th} March, 2015).
16. **K. Banerjee**, J.M. Scaglione, and R.A. LeFebvre, "Integrated Data and Analysis Tool for Used Nuclear Fuel Management," *Trans. Am. Nucl. Soc.* **111**, 338-341, Anaheim, CA (November 2014).
17. J.M. Scaglione, **K. Banerjee**, K.R. Robb, and R.A. LeFebvre, "The Used Nuclear Fuel Storage, Transportation, and Disposal Analysis Resource and Data System," *Proc. of Institute of Nuclear Materials Management (INMM) - 55^{th} Annual meeting*, July 20-24, 2014, Atlanta, Georgia.

18. **K. Banerjee**, and J.M. Scaglione, "Feasibility of Direct Disposal of Dual Purpose Canisters from Criticality Perspective," *Proc. of Institute of Nuclear Materials Management (INMM) - 55th Annual meeting*, July 20-24, 2014, Atlanta, Georgia.
19. J.M. Scaglione, J.L. Peterson, **K. Banerjee**, K.R. Robb, and R.A. LeFebvre, "Integrated Data and Analysis System for Commercial Used Nuclear Fuel Safety Assessments," *Proc. WM2014*, Phoenix, Arizona, USA (March 2014).
20. Gokhan Yesilyurt, **Kaushik Banerjee**, Etienne de Villèle, John C. Lee, and W. R. Martin, "Coupled Nuclear-Thermal-Hydraulic Calculations for VHTRs," *Trans. Am. Nucl. Soc.* **102**, 519-521, San Diego, California (June 2010).
21. **K. Banerjee**, and W. R. Martin, "Kernel Density Estimation Method for Monte Carlo Tallies with Unbounded Variance," *Trans. Am. Nucl. Soc.* **101**, 430-432, Washington, DC (November 2009). **(Best Paper Award)**
22. **K. Banerjee**, and W. R. Martin, "Applying the Kernel Density Flux Estimator to Estimate Flux at a Point," *Trans. Am. Nucl. Soc.* **100**, 294-296, Atlanta, Georgia (June 2009).
23. **K. Banerjee**, and W. R. Martin, "Kernel Density Estimated Global Flux Tallies," *Proc. M&C Topical Meeting*, American Nuclear Society, Saratoga Springs, NY (May 2009).
24. **K. Banerjee**, and W. R. Martin, "Monte Carlo Global Scalar Flux Estimation with Kernel Density Estimator," *Trans. Am. Nucl. Soc.* **99**, 346-347, Reno, NV (November 2008). **(Best Paper Award).**
25. **K. Banerjee**, and W. R. Martin, "A Proposed Kernel Density Estimator Method for Monte Carlo Eigenvalue Calculations," *Proc. PHYSOR-08*, Interlaken, Switzerland (September 2008).

Conference Abstracts

1. R. Devoe, J.M. Scaglione, **K. Banerjee**, and R. LeFebvre, "Automated Dry-Cask Storage Criticality Analysis Using CSAS6 Templates," *ANS Student Conference*, Pennsylvania State University (March 2014).
2. J.M. Scaglione, **K. Banerjee**, R.L. Howard, and E.M. Pierce, "Impacts of Groundwater Ionic Species on Spent Fuel," *American Chemical Society National Meeting*, Dallas, Texas (March 2014).
3. **K. Banerjee**, and W. R. Martin, "Using Kernel Density Estimation for Monte Carlo Tallies with Unbounded Variance," *21st International Conference on Transport Theory*, Politecnico di Torino, Italy (July 2009).
4. **K. Banerjee**, and W. L. Dunn, "Determination of Subsurface Defects Using X-ray Scanning," *6th International Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications*, Hamilton, Canada (June 2005).
5. W. L. Dunn, **K. Banerjee**, and A. Allen, "Feasibility of a Method to Identify Targets That Are Likely to Contain Conventional Explosives," *6th International Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications*, Hamilton, Canada (June 2005).

Selected Presentations

1. Used Nuclear Fuel Storage, Transportation, and Disposal: the US perspective (December 2015), Indian Institute of Technology, Kanpur, India **(Invited)**

2. Spent Fuel Storage and Transportation Systems (March 2012). *Kansas State University*, Kansas **(Invited)**
3. Kernel Density Estimator Methods for Monte Carlo Radiation Transport (March 2012). *Kansas State University*, Kansas **(Invited).**
4. Kernel Density Estimator Methods for Monte Carlo Radiation Transport (November 2010). *Brookhaven National Lab*, NY **(Invited)**.
5. Kernel Density Estimator Methods for Monte Carlo Radiation Transport (October 2009). *Physical and Life Sciences, LLNL*, Livermore, California **(Invited).**

Awards and Honors

- Mathematics and Computation division's (ANS) **Best summary and presentation award**, ANS winter conference (2009), Washington DC.
- Mathematics and Computation division's (ANS) **Best summary and presentation award**, ANS winter conference (2008), Reno, Nevada.
- Rackham Travel Grant to present at the ANS winter conference, Washington, DC.
- Rackham International Travel Grant to present at the PHYSOR-'08 conference, Interlaken, Switzerland.
- Nominated for Outstanding Graduate Research Assistant in the year 2005, Kansas State University, Manhattan, KS.
- Honor member of the honor society for Nuclear Science and Engineering, Alpha Nu Sigma.
- National Scholarship by Govt. of India for outstanding performance in the Secondary Exam (1995-2001).

Grants

- **K. Banerjee (PI)**, G.G. Davidson, S.R. Johnson, T.M. Evans, "Development and Investigation of Advanced Monte Carlo Fission Source Convergence Acceleration Methodologies," ORNL LDRD (Seed) Funding, FY 2015-2016, $190,000.

Services and Activities

- Master's Thesis **Committee Member**: Mudit Mishra, Indian Institute of technology, Kanpur
- Mentoring Summer Technical Interns
- Sponsored and **supervised a group of four students:** senior year design project at Pennsylvania State University (NuCE 431W Section 3 Design Course, 2012)
- **Reviewer:** Journal of Computational Physics, Nuclear Science and Engineering and Annals of Nuclear Energy
- **Reviewer for Transactions:** PHYSOR
- **Reviewer for Transactions:** American Nuclear Society
- Held the post of General Secretary of Society of Student Metallurgists (1999 – 2000), Bengal Engineering College, Shibpore, India.
- Held the post of Treasurer of Society of Student Metallurgists (1998 – 1999), Bengal Engineering College, Shibpore, India.

Teaching Experience

- **Provided introductory nuclear engineering training to all new employee**s at Holtec International.
- Graduate Student Instructor in the Mechanical and Nuclear Engineering Department at Kansas State University from Fall 2003 through Winter 2005 for Thermodynamics II (ME 523) and Heat Transfer (ME 573). Responsibilities included preparing homework solutions, grading homework and exams, holding office hours, conducting weekly review sessions, and delivering lectures (occasionally).

Computer Skills

- Extensive experience with FORTRAN (77, 90), C, C++, PYTHON, PERL, UNIX utilities (SED and AWK) and MATLAB, including software development for research projects.
- Conversant with MCNP5, SCALE, CASMO, RELAP5, and EGS4.

Summer Internships

- Tata Infotech Ltd. (2001), as a C & C++ programmer.
- Bhilai Steel Plant, Under Steel Authority of India Limited (2000).

Professional Membership

- Professional member of American Nuclear Society (ANS).