

JOHN C. WAGNER

Office Address

P.O. Box 2008
Oak Ridge, TN 37831-6170
Phone: 865 241-3570
URL: <http://www.ornl.gov/~6cw>

Home Address

1613 Legacy Park Road
Knoxville, TN 37922
Phone: 865 966-7674

SUMMARY

Nuclear Engineer (PhD) with experience in the use of computational methods applied to the areas of criticality safety, radiation shielding, and reactor analysis; particular expertise in variance reduction methods for Monte Carlo and burnup credit for spent fuel storage, transport, and disposal. Experience developing and implementing new methods in large production codes, performing complex analyses, providing technical bases for regulatory policies, interacting with sponsors, developing proposals, and directing R&D staff in the development and application of nuclear analysis software.

EDUCATION

Pennsylvania State University

Doctor of Philosophy in Nuclear Engineering, December 1997

Thesis title: Acceleration of Monte Carlo Shielding Calculations with an Automated Variance Reduction Technique and Parallel Processing

Master of Science in Nuclear Engineering, December 1994

Thesis title: Monte Carlo Transport Calculations and Analysis for Reactor Pressure Vessel Neutron Fluence

University of Missouri-Rolla

Bachelor of Science in Nuclear Engineering, May 1992

WORK EXPERIENCE

Oak Ridge National Laboratory,

10/03-Present **Group Leader**

Criticality & Shielding Methods & Applications, Nuclear Science & Technology Division

Supervisor: Dr. James E. Rushton

Responsible for 11 technical staff performing a variety of projects involving the development and application of nuclear analysis software. Responsibilities include: directing/managing R&D efforts for projects and staff, program development, staffing, and providing overall technical direction. Principal Investigator for technical projects involving criticality safety of spent fuel, Monte Carlo code development, and radiation shielding analyses.

6/99-10/03 **Research & Development Staff**

Nuclear Analysis Methods & Applications Group, Nuclear Science & Technology Division

Supervisor: Dr. Cecil V. Parks

Performed a variety of projects involving criticality safety, radiation shielding, spent fuel characterization, and radiation therapy, with majority of time spent on burnup credit for spent fuel storage, transport, and disposal, and variance reduction for Monte Carlo simulations. Worked with a variety of codes in the SCALE package, as well as, MCNP, TORT, and HELIOS. Examples of completed major projects include:

- Automated variance reduction for Monte Carlo fixed-source and criticality calculations based on 3-D discrete ordinates adjoint functions. Developed a new code (ADVANTG – Automated Deterministic Variance NreducTion Generator) for automated generation of consistent, deterministic-based weight window and source biasing parameters for the MCNP4C code. Computational speed-ups between ~100 and 100,000 times, as compared to unbiased cases, have been achieved for several relevant fixed-source applications, including nuclear well-logging tools and PWR thermal ex-core detectors.

WORK EXPERIENCE (continued)

- Burnup credit for commercial spent fuel to support existing USNRC regulatory guidance for storage and transportation, and to provide technical justifications and recommendations for future expansion of burnup credit. Notable activities included (1) development of a computational benchmark for the assessment of reactivity margins in a burnup credit cask; (2) studies of reactivity margins associated with fission products, depletion conditions, cooling time, spatial burnup distributions, burnable poison rods, integral burnable absorbers, control rods, and axial power shaping rods; and (3) support of USNRC Phenomenon Identification and Ranking Table (PIRT) process for burnup credit.

Holtec International, **Principal Engineer**

Supervisor: Mr. Michael McNamara

7/97-6/99

Accomplishments and responsibilities included:

- Criticality safety analyses for dry spent fuel storage
 - Performed criticality safety analyses, using MCNP and KENO, for HI-STAR 100 spent fuel storage/transport system and HI-STORM 100 storage system, in accordance with 10CFR71 and 10CFR72.
 - Lead author of criticality chapters for the HI-STAR 100 TSAR and SAR and HI-STORM 100 TSAR.
 - Experience interacting with the USNRC reviewers, culminating in the resolution of all criticality related questions and their issuance of draft Safety Evaluation Reports (SERs) and Certifications of Compliance (CoCs) for the HI-STAR 100 storage and transport system.
 - Assisted in the preparation of proposals, including development of new basket design(s).
- Criticality safety analyses for wet spent fuel storage
 - Performed criticality safety analyses, using MCNP, KENO, and CASMO, to support re-racking spent fuel pools for maximum capacity, in accordance with 10CFR50. Responsibilities included preparation of the criticality safety related chapter (Chapter 4) of the License Amendment Reports, resolution of comments and questions by clients, and finally, where necessary, resolution of questions by the USNRC reviewers.
 - Performed criticality safety analyses for a number of specific purposes other than re-racking, including: expansion of storage capacity, qualification of new fuel types for storage in existing racks, and analysis/qualification of damaged fuel for storage.
 - Assisted in the preparation of proposals, including development of proposed rack design(s).
- Shielding analyses for dry spent fuel storage
 - Consultant and technical reviewer for shielding analyses, using SAS2H, ORIGEN-S, and MCNP, for HI-STAR 100 spent fuel storage/transport system and HI-STORM 100 storage system, in accordance with 10CFR71 and 10CFR72.

Pennsylvania State University, **Graduate Research Assistant**

Advisor: Prof. Alireza Haghghat, Nuclear Engineering Department

8/92 - 7/97

Completed projects include:

- Code development for automatic variance reduction of Monte Carlo (MCNP) calculations using three-dimensional discrete ordinate adjoint functions, resulting in a new code, A³MCNP, which is capable of (1) automatic generation of input files for 3-D S_N TORT calculations, including mesh generation and cross section processing and (2) automatic and effective calculation and utilization of variance reduction parameters (coupled source biasing parameters and cell independent weight windows) from S_N adjoint functions to accelerate Monte Carlo calculations;
- Adaptation of MCNP for parallel processing with the Message Passing Interface (MPI);
- Monte Carlo calculations and analyses of reactor pressure vessel neutron fluence for Three Mile Island Unit 1 (TMI-1), including detailed comparisons to measured data and deterministic (DORT) results;
- Co-organizer and co-instructor of the International Workshop/Training Course on Transport Methodologies and Uncertainty Estimation for PWR Pressure Vessel Fluence and BWR Shield/Shroud Dose Calculations (June 19-23, 1995), the Second International Training Course/Workshop on Methodologies for Particle Transport Simulation and Their Application to Reactor Dosimetry/Shielding (June 2-7, 1996), and the Third International Training Course/Workshop on Methodologies for Particle Transport Simulation and Their Application to Reactor Dosimetry/Shielding (May 19-23, 1997);
- Monte Carlo design/optimization studies for the Penn State Breazeale Reactor's (PSBR) D₂O tank and collimator to improve the imaging capabilities at the PSBR; and
- Characterization of the neutron and gamma radiation environments at the Army Pulse Radiation Facility (APRF) with the Monte Carlo method, including comparisons to measured data.

WORK EXPERIENCE (continued)

Holtec International, Consultant

Contacts: Dr. Stanley E. Turner and Everett L. Redmond II

9/96 - 3/97 Performed technical review of criticality (MCNP & KENO) and shielding (SAS2H, ORIGEN-S & MCNP) calculations associated with the NRC license submittal for the HI-STAR 100 and HI-STORM 100 spent fuel storage/transport systems and shielding analysis for the Private Fuel Storage Facility.

Los Alamos National Laboratory, Graduate Research Assistant

Radiation Transport Group (X-6/XTM), Applied Theoretical Physics Division

Supervisor: Dr. John S. Hendricks

5/94 - 7/94 Improved and enhanced the CRSRD computer code, which translates multigroup cross sections into a format suitable to MCNP. Assumed the major portion of the responsibility for coordinating and teaching the MCNP Multigroup/Adjoint Course (LANL, June 6-7, 1994).

Supervisor: Dr. John S. Hendricks

5/93 - 8/93 Investigated the usage and validity of the general purpose Monte Carlo transport code MCNP for multigroup/adjoint calculations. Published as LA-12704, "MCNP: Multigroup/Adjoint Capabilities."

Supervisor: Dr. Gregg W. McKinney

6/92 - 8/92 Investigated the suitability of the general purpose Monte Carlo transport code MCNP for criticality safety calculations. Compared MCNP and KENO results for benchmarking purposes. Published as LA-12415, "MCNP: Criticality Safety Benchmark Problems."

Oak Ridge National Laboratory, Summer Research Participant

Research Reactors Division

Supervisors: Dr. David H. Cook and B. Lamar Leppard

6/91 - 8/91 Two major projects included: (1) safety evaluation of the proposed High Flux Isotope Reactor (HFIR) fire protection system and (2) determination of hydrogen accumulation in pony motor battery rooms.

CITIZENSHIP / SECURITY CLEARANCE

US Citizen

2/99-12/02 Department of Energy (DOE) L-level security clearance

12/02-Present DOE Q-level security clearance

HONORS & ACTIVITIES

- UT-Battelle Significant Event Award, March 2003 (for contribution as technical lead for investigating issues and formulating technical recommendations associated with burnup credit)
- UT-Battelle Awards Night, Outstanding Accomplishment in Science & Technology Award for Early Career Engineering Accomplishment (2002) (for excellence in engineering research)
- Best Paper Award from the Nuclear Criticality Safety Division (ANS Winter Meeting, November 2000)
- Best Benchmarking Paper Award from the Math & Computations Division of the ANS (M&C Meeting, May 1995)
- Best Paper Award in Reactor Physics at 1993 ANS Student Conference (Rensselaer Polytechnic Institute)
- INPO Fellowship 1992-1993; Power Engineering Scholarship, 1991
- Reviewer for *Nuclear Technology* and *Nuclear Science & Engineering*, 1999 to present
- Reviewer for ANS/ASTM 9th Intl. Symposium on Reactor Dosimetry, Sept. 1996
- Member of the American Nuclear Society (ANS)
- Elected to Executive Committee, Mathematics & Computation Division, ANS, 2001-2004
- Elected to Treasurer, Radiation Protection & Shielding Division, ANS, 2003-2005
- Elected to Board, ANS Oak Ridge/Knoxville Local Section, 2001-2004; Program Chair 2001-2003
- Member of Alpha Nu Sigma - Nuclear Engineering Honor Society
- Member of ANS Standards Committee 19.10, "Fast Neutron Fluence in Light Water Reactor Pressure Vessels."

HONORS & ACTIVITIES (continued)

PATENTS

- Ventilated Overpack Apparatus and Method for Storing Spent Nuclear Fuel, Patent No. US 6,519,307 B1, February 11, 2003.

PUBLICATIONS

1. J.C. WAGNER, J.E. SISOLAK, and G.W. MCKINNEY, "MCNP: Criticality Safety Benchmark Problems," LA-12415, Los Alamos National Laboratory (1992).
2. J.C. WAGNER, A. HAGHIGHAT, and B.G. PETROVIC, "Investigation of Pressure Vessel Neutron Fluence Calculation with Monte Carlo," *Trans. Am. Nucl. Soc.*, **68** 446-448 (1993).
3. G.W. MCKINNEY, J.C. WAGNER, and J.E. SISOLAK, "MCNP/KENO Criticality Comparison," *Proc. of the Topical Meeting on Physics and Methods in Criticality Safety*, Nashville, TN, September 19-23, American Nuclear Society, Order 700186, 207 (1993).
4. J.C. WAGNER, E.L. REDMOND II, S.P. PALMTAG, and J.S. HENDRICKS, "MCNP: Multigroup/Adjoint Capabilities," LA-12704, Los Alamos National Laboratory (1994).
5. J.C. WAGNER, A. HAGHIGHAT, and B.G. PETROVIC, "Comparison of Monte Carlo and Synthesized 3-D Deterministic Models for Reactor Cavity Dosimetry Calculations," *Proc. of the Eighth Int. Conf. on Radiation Shielding*, Arlington, TX, 714-720 (Apr. 1994).
6. J.C. WAGNER, A. HAGHIGHAT, and B.G. PETROVIC, "Multigroup Versus Continuous-Energy MCNP for PWR Fluence Calculations," *Trans. Am. Nucl. Soc.*, **70** 378-380 (1994).
7. J.C. WAGNER, "Monte Carlo Transport Calculations and Analysis for Reactor Pressure Vessel Neutron Fluence," *MS Thesis*, The Pennsylvania State University, Nuclear Engineering (Dec. 1994).
8. J.C. WAGNER, A. HAGHIGHAT, B.G. PETROVIC, and H.L. HANSHAW, "Benchmarking of Synthesized 3-D Sn Transport Methods for Pressure Vessel Fluence Calculations with Monte Carlo," *Proc. Int. Conf. on Mathematics and Computations, Reactor Physics, and Environmental Analyses*, Portland, OR, 1214-1222 (May 1995). (Best benchmark paper award)
9. H.L. HANSHAW, A. HAGHIGHAT, and J.C. WAGNER, "Multigroup Cross-Section Generation with Spatial and Angular Adjoint Weighting," *Trans. Am. Nucl. Soc.*, **73** 175-177 (1995).
10. J.C. WAGNER and A. HAGHIGHAT, "Deterministic Adjoint Functions for Biasing Monte Carlo Reactor Cavity Dosimetry Calculations," *Trans. Am. Nucl. Soc.*, **73** 432-434 (1995).
11. J.C. WAGNER, A. HAGHIGHAT, and B.G. PETROVIC, "Monte Carlo Transport Calculations and Analysis for Reactor Pressure Vessel Neutron Fluence," *Nucl. Technol.*, **114** 373-398 (1996).
12. A. HAGHIGHAT, H.L. HANSHAW, and J.C. WAGNER, "Multigroup Cross Section Generation with Adjoint Weighting and its Application to PV Dosimetry," *1996 Radiation Protection & Shielding Topical Meeting*, No. Falmouth, MA, 173-180 (Apr. 1996).
13. J.C. WAGNER and A. HAGHIGHAT, "Application of the Discrete Ordinates Adjoint Function to Accelerating Monte Carlo Reactor Cavity Dosimetry Calculations," *1996 Radiation Protection & Shielding Topical Meeting*, No. Falmouth, MA, 345-352 (Apr. 1996).

PUBLICATIONS (continued)

14. A. HAGHIGHAT, B. PETROVIC, J.C. WAGNER, H.L. HANSHAW, and M. MAHGEREFTEH, "Uncertainties in Transport Theory Pressure Vessel Neutron Fluence Calculations," *Trans. Am. Nucl. Soc.*, **74** 140-142 (1996).
15. J.C. WAGNER, A.J. BARATTA, and J.W. GERDES, "Characterization of the Radiation Environment at the Army Pulse Radiation Facility with Monte Carlo," *Ninth Intl. Symposium on Reactor Dosimetry*, Prague, Czech Republic, 762-769, September 2-6, 1996.
16. J.C. WAGNER and A. HAGHIGHAT, "Acceleration of Monte Carlo Reactor Cavity Dosimetry Calculations with the Discrete Ordinates Adjoint Function," *Ninth Intl. Symposium on Reactor Dosimetry*, Prague, Czech Republic, 754-761, September 2-6, 1996.
17. J.C. WAGNER and A. HAGHIGHAT, "Parallel MCNP Monte Carlo Transport Calculations with MPI," *Trans. Am. Nucl. Soc.*, **75** 338-339 (1996).
18. J.C. WAGNER and A. HAGHIGHAT, "Monte Carlo PWR Cavity Dosimetry Calculations using an Automatic Variance Reduction Technique," invited, *Joint Int. Conf. on Mathematical Methods and Supercomputing for Nuclear Applications*, Saratoga Springs, 1031-1039, October 6-10, 1997.
19. J.C. WAGNER and A. HAGHIGHAT, "Automatic Variance Reduction for Monte Carlo Shielding Calculations with the Discrete Ordinates Adjoint Function," *Joint Int. Conf. on Mathematical Methods and Supercomputing for Nuclear Applications*, Saratoga Springs, 671-680, October 6-10, 1997.
20. B.G. PETROVIC, A. HAGHIGHAT and J.C. WAGNER, "Definition of a Computational 3-D Benchmark Problem for PWR Pressure Vessel Neutron Transport Calculations," *Joint Int. Conf. on Mathematical Methods and Supercomputing for Nuclear Applications*, Saratoga Springs, 292-301, October 6-10, 1997.
21. B.G. PETROVIC, J.C. WAGNER and A. HAGHIGHAT, "Verification of Improved Synthesized 3-D Sn and Monte Carlo Methods for Pressure Vessel Fast Neutron Fluence Calculations," *Joint Int. Conf. on Mathematical Methods and Supercomputing for Nuclear Applications*, Saratoga Springs, 1586-1595, October 6-10, 1997.
22. J.C. WAGNER, "Acceleration of Monte Carlo Shielding Calculations with an Automated Variance Reduction Technique and Parallel Processing," *Ph.D. Thesis*, The Pennsylvania State University, Nuclear Engineering (Dec. 1997).
23. J.C. WAGNER and A. HAGHIGHAT, "Automatic Variance Reduction of Monte Carlo Shielding Calculations Using the Discrete Ordinates Adjoint Function," *Nucl. Sci. Eng.*, **128** 186-208, (1998).
24. J.C. WAGNER, J.W. GERDES, and A.J. BARATTA, "Comparison of Calculated and Measured Neutron and Gamma Radiation Environments at the Army Pulse Radiation Facility," invited, *1998 ANS Radiation Protection and Shielding Division Topical Conference*, Nashville, TN, April 19-23, 1998.
25. J.C. WAGNER and A. HAGHIGHAT, "Automatic Variance Reduction for Monte Carlo Shielding Calculations," *1998 ANS Radiation Protection and Shielding Division Topical Conference*, Nashville, TN, April 19-23, 1998.
26. A. HAGHIGHAT, H. HIRUTA, B. PETROVIC and J.C. WAGNER, "Performance of the Automated Adjoint Accelerated MCNP (A³MCNP) for Simulation of a BWR Core Shroud Problem," *Proceedings of the International Conference on Mathematics and Computation, Reactor Physics, and Environmental Analysis in Nuclear Applications*, Madrid, Spain, September 27-30, 1999.
27. C.V. PARKS, M.D. DEHART and J.C. WAGNER, *Review and Prioritization of Technical Issues Related to Burnup Credit for LWR Fuel*, NUREG/CR-6665 (ORNL/TM-1999/303), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, February 2000.
28. J.C. WAGNER and M.D. DEHART, *Review of Axial Burnup Distribution Considerations for Burnup Credit Calculations*, ORNL/TM-1999/246, Lockheed Martin Energy Research Corp., Oak Ridge National Laboratory, March 2000.

PUBLICATIONS (continued)

29. A. HAGHIGHAT, G.E. SJODEN, and J.C. WAGNER, "Advanced 3-D Deterministic and Monte Carlo Codes for Simulation of Real-Life Complex Nuclear Systems," *Trans. Am. Nucl. Soc.*, **82**, June 2000.
30. J.C. WAGNER and M.D. DEHART, "Investigation of BWR Depletion Calculations with SAS2H," *Trans. Am. Nucl. Soc.*, **82**, June 2000.
31. J.C. WAGNER and C.V. PARKS, *Critical Review of the Practice of Equating the Reactivity of Spent Fuel to Fresh Fuel in Burnup Credit Criticality Safety Analyses for PWR Spent Fuel Pool Storage*, NUREG/CR-6683 (ORNL/TM-1999/230), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, September 2000.
32. J.C. WAGNER, M.D. DEHART and B.L. BROADHEAD, *Investigation of Burnup Credit Modeling Issues Associated with BWR Fuel*, ORNL/TM-1999/193, Lockheed Martin Energy Research Corp., Oak Ridge National Laboratory, October 2000.
33. C.V. PARKS, I.C. GAULD, J.C. WAGNER, B.L. BROADHEAD, M.D. DEHART, and D.D. EBERT, "Research Supporting Implementation of Burnup Credit in the Criticality Safety Assessment of Transport and Storage Casks," in Proc. of the Twenty-Eighth Water Reactor Safety Information Meeting, Bethesda, Maryland, October 23-25, 2000.
34. A. HAGHIGHAT and J.C. WAGNER, "Application of A³MCNP to Radiation Shielding Problems," in *Proceedings of International Conference on Monte Carlo for Radiation Physics, Particle Transport Simulation and Applications*, Lisbon, Portugal, October 23-26, 2000.
35. J.C. WAGNER and C.V. PARKS, "Impact of Burnable Poison Rods on PWR Burnup Credit Criticality Safety Analyses," *Trans. Am. Nucl. Soc.*, **83**, 130-134, November 2000. (Best paper award from Nuclear Criticality Safety Div.)
36. S.M. BOWMAN, I.C. GAULD, and J.C. WAGNER, *Recommendations on Standardized Technical Specifications for Spent Fuel Storage Casks*, NUREG/CR-6716 (ORNL/TM-2000/385), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, March 2001.
37. C.V. PARKS, M.D. DEHART, and J.C. WAGNER, "Phenomena and Parameters Important to Burnup Credit," in *Proc. of Technical Committee Meeting on the Evaluation and Review of the Implementation of Burnup Credit in Spent Fuel Management Systems*, pp. 233-247, July 10-14, 2000, Vienna, Austria (August 2001).
38. C.V. PARKS and J.C. WAGNER, "Issues for Effective Implementation of Burnup Credit," in *Proc. of Technical Committee Meeting on the Evaluation and Review of the Implementation of Burnup Credit in Spent Fuel Management Systems*, pp. 298-308, July 10-14, 2000, Vienna, Austria (August 2001).
39. J.C. WAGNER and C.V. PARKS, "Critical Review of the Practice of Equating the Reactivity of Spent Fuel to Fresh Fuel in Burnup Credit Criticality Safety Analyses for PWR Spent Fuel Pool Storage," *Nucl. Technol.* **136(1)**, 130-140, October 2001.
40. J.C. WAGNER, *Computational Benchmark for Estimation of Reactivity Margin from Fission Products and Minor Actinides in PWR Burnup Credit*, NUREG/CR-6747 (ORNL/TM-2000/306), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, October 2001.
41. C.E. SANDERS and J.C. WAGNER, "Impact of Integral Burnable Absorbers on PWR Burnup Credit Criticality Safety Analysis," 35235.pdf, in *Proc. of 2001 ANS Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety*, Reno, NV, November 11-15, 2001.
42. C.E. SANDERS and J.C. WAGNER, "Parametric Study of Control Rod Exposure for PWR Burnup Credit Criticality Safety Analyses," 35281.pdf, in *Proc. of 2001 ANS Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety*, Reno, NV, November 11-15, 2001.

PUBLICATIONS (continued)

43. J.C. WAGNER, "Addressing the Axial Burnup Distribution in PWR Burnup Credit Criticality Safety," 35218.pdf, in *Proc. of 2001 ANS Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety*, Reno, NV, November 11-15, 2001.
44. C.V. PARKS, J.C. WAGNER, I.C. GAULD, B.L. BROADHEAD, and C.E. SANDERS, "U.S. Regulatory Research Program for Implementation of Burnup Credit in Transport Casks," 33334.pdf in *Proc. of the 13th International Symposium on the Packaging and Transportation of Radioactive Material (PATRAM2001)*, Chicago, IL, September 3-7, 2001.
45. C.E. SANDERS and J.C. WAGNER, *Parametric Study of the Effect of Control Rods for PWR Burnup Credit*, NUREG/CR-6759 (ORNL/TM-2001/69), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, February 2002.
46. C.E. SANDERS and J.C. WAGNER, *Study of the Effect of Integral Burnable Absorbers for PWR Burnup Credit*, NUREG/CR-6760 (ORNL/TM-2000/321), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, March 2002.
47. J.C. WAGNER and C.V. PARKS, *Parametric Study of the Effect of Burnable Poison Rods for PWR Burnup Credit*, NUREG/CR-6761 (ORNL/TM-2000/373), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, March 2002.
48. J.C. WAGNER, "An Automated Deterministic Variance Reduction Generator for Monte Carlo Shielding Applications," wagner1m.pdf, Paper Log 131 in *Proc. of American Nuclear Society 12th Biennial RPSD Topical Meeting*, April 12-14, 2002, Santa Fe, NM.
49. C.E. SANDERS and J.C. WAGNER, "Investigation of Average and Pin-Wise Burnup Modeling of PWR fuel," *Trans. Am. Nucl. Soc.*, **86**, 98-100, June 2002.
50. J.C. WAGNER and C.E. SANDERS, "Investigation of the Effect of Fixed Absorbers on the Reactivity of PWR Spent Nuclear Fuel for Burnup Credit," *Nucl. Technol.* **139(2)**, 91-126, August 2002.
51. A. HAGHIGHAT and J.C. WAGNER, "Monte Carlo Variance Reduction with Deterministic Importance Functions," *Progress in Nuclear Energy*, **42(1)**, 25-53, January 2003.
52. J.C. WAGNER and C.V. PARKS, *Recommendations on the Credit for Cooling Time in PWR Burnup Credit Analyses*, NUREG/CR-6781 (ORNL/TM-2001/272), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, January 2003.
53. J.C. WAGNER and C.E. SANDERS, "Assessment of Reactivity Margins and Loading Curves for PWR Burnup Credit Cask Designs," NUREG/CR-6800 (ORNL/TM-2002/006), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, March 2003.
54. J.C. WAGNER, M.D. DEHART, and C.V. PARKS, "Recommendations for Addressing Axial Burnup in PWR Burnup Credit Analyses," NUREG/CR-6801 (ORNL/TM-2001/273), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, March 2003.
55. H.P. SMITH and J.C. WAGNER, "A Case Study in Manual and Automated Monte Carlo Variance Reduction with a Deep Penetration Reactor Shielding Problem," 050.pdf in *Proc. of Nuclear Mathematical and Computational Sciences: A Century in Review, A Century Anew*, April 6-11, 2003, LaGrange Park, IL 2003, ISBN0-89448-674-8, American Nuclear Society Order No. 700300.
56. K.R. ELAM, J.C. WAGNER, and C.V. PARKS, "Scoping Studies for the Effects of Fuel Failure on Criticality Safety and Radiation Dose of Spent Fuel Casks," NUREG/CR-6835 (ORNL/TM-2002/255), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, September 2003.

PUBLICATIONS (continued)

57. J.C. WAGNER, "Evaluation of Burnup Credit for Accommodating PWR Spent Nuclear Fuel in High-capacity Cask Designs," pp. 684-689 in *Proc. of the 7th International Conference on Nuclear Criticality Safety (ICNC2003)*, October 20-24, Tokai-mura, Ibaraki, Japan JAERI-Conf 2003-019, Japan Atomic Energy Research Institute (2003).
58. J. C. WAGNER, "Impact of Soluble Boron Modeling for PWR Burnup Credit Criticality Safety Analyses," *Trans. Am. Nucl. Soc.* **89**, 120-122, Nov. (2003).
59. C.V. PARKS and J.C. WAGNER, "Current Status and Potential Benefits of Burnup Credit for Spent Fuel Transportation," *PBNC Proc. of the 14th Pacific Basin Nuclear Conference*, Honolulu, Hawaii, March 21-25, ANS Order #: 700305, ISBN: 0-89448-679-9 (2004).
60. B.L. BROADHEAD and J.C. WAGNER, "Effective Biasing Schemes for Duct Streaming Problems," *International Conference on Radiation Shielding (ICRS-10)*, May 9-14, Funchal, Portugal (2004).
61. H.P. SMITH and J.C. WAGNER, "A Case Study in Manual and Automated Monte Carlo Variance Reduction with a Deep Penetration Reactor Shielding Problem," submitted by invitation for special edition of *Nucl. Sci. Eng.*
62. J.C. WAGNER, "Criticality Analysis of Assembly Misload in a PWR Burnup Credit Cask," NUREG/CR-XXXX (ORNL/TM-2004/52), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, in publication.

REFERENCES AND TRANSCRIPTS AVAILABLE UPON REQUEST