

# John C. Wagner, Ph.D.

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## SUMMARY

*Nuclear Engineer (Ph.D.) with experience in the development and use of computational methods for criticality safety, radiation shielding, and reactor analysis; particular expertise in Monte Carlo transport, variance reduction methods, and burnup credit criticality safety for spent fuel storage, transport, and disposal. Experience developing and implementing new methods in large production codes, performing, documenting, and reviewing complex analyses, developing technical bases for regulatory policies, providing guidance to sponsors on a broad variety of technical issues, developing proposals, and providing technical leadership and managing R&D staff in the development and application of nuclear analysis software.*

## EDUCATION

*Pennsylvania State University*

**Doctor of Philosophy in Nuclear Engineering**, December 1997

Dissertation 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*

*Missouri University of Science & Technology (formerly University of Missouri-Rolla)*

**Bachelor of Science in Nuclear Engineering**, May 1992

## WORK EXPERIENCE

*Oak Ridge National Laboratory,*

*10/03–Present*      **Group Leader**

Radiation Transport & Criticality Group, Nuclear Science & Technology Division

Supervisor: Dr. James E. Rushton

Responsible for 22 R&D technical staff performing a variety of projects involving the development and application of software for analysis, safety, and design of nuclear systems. Responsibilities included directing/managing R&D efforts for projects and staff, program development, staffing, and providing overall technical leadership and direction. Principal Investigator for technical projects involving criticality safety, burnup credit for transportation and storage, spent fuel characterization, radiation transport code application and development, and radiation protection and shielding analyses. Specific examples of projects (sponsors) include:

- Technical leader for YMP Postclosure Criticality (DOE OCRWM Lead Laboratory for Repository Systems)
- SCALE Software Development and Technical Assistance for Transportation and Storage Licensing (NRC)
- PWR Facility Dose Modeling & Nuclear Vulnerability Analyses with MCNP (DTRA)
- Development of New Method for Global Variance Reduction (DTRA)
- Develop Technical Basis to ISG-8 Guidance to Include Fission Product Burnup Credit (NRC/RES)
- Technical Review of Burnup Credit License Applications (NRC/SFST)
- Burnup Credit Data Assessment and Evaluation (DOE OCRWM Office of Logistics Management)
- DOE SNF Data Assessment and Analysis (DOE OCRWM Office of Logistics Management)
- Moderator Intrusion Consequence Analyses for Commercial Spent Fuel Transport (NRC/SFST)
- Advanced Variance Reduction for PWR Ex-vessel Detector Response Calculations (Duke)

## WORK EXPERIENCE (continued)

### 1/07–11/08 **Project Manager (Lead, Postclosure Criticality Safety for YMP)**

Nuclear Systems Design, Analysis, and Safety Group, Nuclear Science & Technology Division

Supervisor: Dr. Cecil V. Parks

On assignment to the DOE Office of Civilian Radioactive Waste Management's (OCRWM) Lead Laboratory for Repository Systems as Lead for Postclosure Criticality Safety at the Yucca Mountain Project (YMP). In this capacity, responsible for developing, planning, and implementing a 5-year, multimillion-dollar experimental program to establish the technical data needed to justify full burnup credit in the Postclosure criticality safety evaluation, managing the YMP Postclosure criticality department staff and work activities, and interfacing with the customer (DOE OCRWM), regulator, and other relevant stakeholders.

### 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, DOORS, 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 reduction Generator) for automated generation of consistent, deterministic-based weight window and source biasing parameters for the MCNP/MCNPX 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.
- Burnup credit for commercial spent fuel to support existing NRC regulatory guidance for storage and transportation, and to provide technical basis and recommendations for expansion of burnup credit (NRC ISG-8, Rev. 2). 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, isotopic validation approaches, burnable poison rods, integral burnable absorbers, control rods, and axial power shaping rods; and (3) support of NRC Phenomenon Identification & Ranking Table (PIRT) process for burnup credit.

### Holtec International, **Principal Engineer**

Supervisors: Mr. Michael McNamara / Dr. K.P. Singh

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 NRC 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 where necessary, resolution of questions by NRC 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.

## WORK EXPERIENCE (continued)

### Pennsylvania State University, Graduate Research Assistant

Advisor: Prof. Alireza Haghighat, Nuclear Engineering Department

8/92–7/97 Completed projects include:

- Code development for automated variance reduction of Monte Carlo (MCNP) calculations using 3-D discrete ordinate adjoint functions, resulting in a new code, A<sup>3</sup>MCNP, which is capable of (1) automatic generation of input files for 3-D S<sub>N</sub> 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<sub>N</sub> 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) D<sub>2</sub>O 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.

### 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 Lepard

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; SCI

## HONORS & ACTIVITIES

- Nominated for participation in inaugural ORNL Developing Leadership Potential program (completed 12/2007)
- Nuclear Science & Technology Division Scientific and Technical Award (December 2006) [for accelerated completion of the event response for the Nuclear Vulnerability Project]
- Nuclear Science & Technology Division Scientific and Technical Award (April 2006) [for support of the DOE Integrated Transportation Operation Project Work Group]
- 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 Nuclear Criticality Safety Division (ANS Winter Meeting, November 2000)
- Best Benchmarking Paper Award from Mathematics & Computations Division of the ANS (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*; *Nuclear Science & Engineering*; *Annals of Nuclear Energy*
- Reviewer for ANS/ASTM 9th Intl. Symposium on Reactor Dosimetry (September 1996)
- Member of the American Nuclear Society (ANS)
- Elected to Executive Committee, Mathematics & Computation Division, ANS (2001–2004)
- Elected Chair, Radiation Protection & Shielding Division, ANS (2007); Vice Chair (2006), Treasurer (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”
- Member of ANSI N14.35 Writing Group, “Verification of Burnup Levels For Spent Nuclear Fuel Casks”
- Member of OECD/NEA Working Party on Nuclear Criticality Safety (WPNCS) Expert Groups on Burnup Credit Criticality Safety and Source Convergence for Criticality Analyses

## PATENTS

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

## PUBLICATIONS

### Ph.D. Dissertation

J.C. WAGNER, “Acceleration of Monte Carlo Shielding Calculations with an Automated Variance Reduction Technique and Parallel Processing,” *Ph.D. Dissertation*, The Pennsylvania State University, Nuclear Engineering (December 1997).

### M.S. Thesis

J.C. WAGNER, “Monte Carlo Transport Calculations and Analysis for Reactor Pressure Vessel Neutron Fluence,” *M.S. Thesis*, The Pennsylvania State University, Nuclear Engineering (December 1994).

### Journal Articles

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).

## PUBLICATIONS (continued)

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).

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.

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.

A. HAGHIGHAT and J.C. WAGNER, "Monte Carlo Variance Reduction with Deterministic Importance Functions," *Progress in Nuclear Energy* **42(1)**, 25–53, January 2003 [invited paper, 5<sup>th</sup> most downloaded PNE paper in 2003].

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," *Nucl. Sci. Eng.* **149**, 23–37, 2005 [invited paper].

C.V. PARKS, J.C. WAGNER, D.E. MUELLER, and I.C. GAULD, "Full Burnup Credit in Transport and Storage Casks—Benefits and Implementation," *Radwaste Solutions* **14(2)**, 32–41, March/April 2007.

J.C. WAGNER, D.E. PELOW, and E.D. BLAKEMAN, "A New Method for Global and Semi-Global Variance Reduction in Monte Carlo," to be submitted to *Nucl. Sci. Eng.*

## Technical Reports

J.C. WAGNER, J.E. SISOLAK, and G.W. MCKINNEY, *MCNP: Criticality Safety Benchmark Problems*, LA-12415, Los Alamos National Laboratory, 1992.

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.

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.

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.

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.

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.

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.

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.

## **PUBLICATIONS (continued)**

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.

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.

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.

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.

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.

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.

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.

E.D. BLAKEMAN, D.E. PELOW, J.C. WAGNER, B.D. MURPHY, and D.E. MUELLER, *PWR Facility Dose Modeling Using MCNP5 and the CADIS/ADVANTG Variance-Reduction Methodology*, ORNL/TM-2007/133, Oak Ridge National Laboratory, Oak Ridge, Tenn., September 2007.

J.C. WAGNER, *Criticality Analysis of Assembly Misload in a PWR Burnup Credit Cask*, NUREG/CR-6955 (ORNL/TM-2004/52), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, January 2008.

G. RADULESCU, D.E. MUELLER, and J.C. WAGNER, *Sensitivity and Uncertainty Analysis of Commercial Reactor Criticals for Burnup Credit*, NUREG/CR-6951 (ORNL/TM-2006/87), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, January 2008.

### **Full Conference Papers**

G.W. MCKINNEY, J.C. WAGNER, and J.E. SISOLAK, "MCNP/KENO Criticality Comparison," *Proceedings of the Topical Meeting on Physics and Methods in Criticality Safety*, Nashville, TN, September 19–23, American Nuclear Society, Order 700186, p. 207, 1993.

J.C. WAGNER, A. HAGHIGHAT, and B.G. PETROVIC, "Comparison of Monte Carlo and Synthesized 3-D Deterministic Models for Reactor Cavity Dosimetry Calculations," *Proceedings of the Eighth Int. Conf. on Radiation Shielding*, Arlington, TX, pp. 714–720, April 1994.

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," *Proceedings of the Int. Conf. on Mathematics and Computations, Reactor Physics, and Environmental Analyses*, Portland, OR, pp. 1214–1222, May 1995 [Best Benchmark Paper Award].

## PUBLICATIONS (continued)

- 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, pp. 173–180, April 1996.
- 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, pp. 345–352, April 1996.
- 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, pp. 762–769, September 2–6, 1996.
- 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, pp. 754–761, September 2–6, 1996.
- J.C. WAGNER and A. HAGHIGHAT, "Monte Carlo PWR Cavity Dosimetry Calculations using an Automatic Variance Reduction Technique," *Joint Int. Conf. on Mathematical Methods and Supercomputing for Nuclear Applications*, Saratoga Springs, pp. 1031–1039, October 6–10, 1997 [invited paper].
- 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, pp. 671–680, October 6–10, 1997.
- B.G. PETROVIC, A. HAGHIGHAT and J.C. WAGNER, "Definition of a Calculational 3-D Benchmark Problem for PWR Pressure Vessel Neutron Transport Calculations," *Joint Int. Conf. on Mathematical Methods and Supercomputing for Nuclear Applications*, Saratoga Springs, pp. 292–301, October 6–10, 1997.
- 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, pp. 1586–1595, October 6–10, 1997.
- 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," *1998 ANS Radiation Protection and Shielding Division Topical Conference*, Nashville, TN, April 19–23, 1998 [invited paper].
- 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.
- A. HAGHIGHAT, H. HIRUTA, B. PETROVIC and J.C. WAGNER, "Performance of the Automated Adjoint Accelerated MCNP (A<sup>3</sup>MCNP) 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.
- 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," *Proceedings of the Twenty-Eighth Water Reactor Safety Information Meeting*, Bethesda, MD, October 23–25, 2000.
- A. HAGHIGHAT and J.C. WAGNER, "Application of A<sup>3</sup>MCNP to Radiation Shielding Problems," *Proceedings of the International Conference on Monte Carlo for Radiation Physics, Particle Transport Simulation and Applications*, Lisbon, Portugal, October 23–26, 2000.
- C.V. PARKS, M.D. DEHART, and J.C. WAGNER, "Phenomena and Parameters Important to Burnup Credit," *Proceedings of the 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.

## PUBLICATIONS (continued)

C.V. PARKS and J.C. WAGNER, "Issues for Effective Implementation of Burnup Credit," *Proceedings of the 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.

C.E. SANDERS and J.C. WAGNER, "Impact of Integral Burnable Absorbers on PWR Burnup Credit Criticality Safety Analysis," *Proceedings of the 2001 ANS Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety*, Reno, NV, November 11–15, 2001.

C.E. SANDERS and J.C. WAGNER, "Parametric Study of Control Rod Exposure for PWR Burnup Credit Criticality Safety Analyses," *Proceedings of the 2001 ANS Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety*, Reno, NV, November 11–15, 2001.

J.C. WAGNER, "Addressing the Axial Burnup Distribution in PWR Burnup Credit Criticality Safety," *Proceedings of the 2001 ANS Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety*, Reno, NV, November 11–15, 2001.

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," *Proceedings of the 13<sup>th</sup> International Symposium on the Packaging and Transportation of Radioactive Material (PATRAM2001)*, Chicago, IL, September 3–7, 2001.

J.C. WAGNER, "An Automated Deterministic Variance Reduction Generator for Monte Carlo Shielding Applications," *Proceedings of the American Nuclear Society 12th Biennial RPSD Topical Meeting*, Santa Fe, NM, April 12–14, 2002.

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," *Proceedings of the Nuclear Mathematical and Computational Sciences: A Century in Review, A Century Anew*, April 6–11, 2003, LaGrange Park, IL (2003), ISBN 0-89448-674-8, American Nuclear Society Order No. 700300.

J.C. WAGNER, "Evaluation of Burnup Credit for Accommodating PWR Spent Nuclear Fuel in High-Capacity Cask Designs," *Proceedings of the 7th International Conference on Nuclear Criticality Safety (ICNC2003)*, pp. 684–689, October 20–24, Tokai-mura, Ibaraki, Japan JAERI-Conf 2003-019, Japan Atomic Energy Research Institute (2003).

C.V. PARKS and J.C. WAGNER, "Current Status and Potential Benefits of Burnup Credit for Spent Fuel Transportation," *Proceedings of the 14th Pacific Basin Nuclear Conference*, Honolulu, Hawaii, March 21–25, ANS Order #: 700305, ISBN: 0-89448-679-9 (2004).

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).

C.V. PARKS and J.C. WAGNER, "Status of Burnup Credit for Transportation of SNF in the United States," *International Symposium on the Packaging & Transportation of Radioactive Materials*, Berlin, Germany, September 20–24, 2004.

J.C. WAGNER and D.E. MUELLER, "Updated Evaluation of Burnup Credit for Accommodating PWR Spent Nuclear Fuel in High-Capacity Cask Designs," *Proceedings of the 2005 Nuclear Criticality Safety Division Topical Meeting*, Knoxville, TN, September 19–22, 2005.

C.V. PARKS and J.C. WAGNER, "A Coordinated U.S. Program to Address Full Burnup Credit in Transport and Storage Casks," *Proceedings of the IAEA Technical Meeting on Advances in Applications of Burnup Credit to Enhance Spent Fuel Transportation, Storage, Reprocessing and Disposition*, London, U.K., August 29–September 2, 2005.

J.C. WAGNER and D.E. MUELLER, "Assessment of Benefits for Extending Burnup Credit in Transporting PWR Spent Nuclear Fuel in the USA," *Proceedings of the IAEA Technical Meeting on Advances in Applications of Burnup Credit to Enhance Spent Fuel Transportation, Storage, Reprocessing and Disposition*, London, U.K., August 29–September 2, 2005.



## PUBLICATIONS (continued)

D.E. MUELLER and J.C. WAGNER, "Application of Sensitivity/Uncertainty Methods to Burnup Credit Criticality Validation," *Proceedings of the IAEA Technical Meeting on Advances in Applications of Burnup Credit to Enhance Spent Fuel Transportation, Storage, Reprocessing and Disposition*, London, U.K., August 29–September 2, 2005.

D.E. PELOW and J.C. WAGNER, "Automated Variance Reduction for SCALE Shielding Calculations," *Proceedings of the ANS 14th Biennial Topical Meeting of the Radiation Protection and Shielding Division*, pp. 556–558, Carlsbad, New Mexico, April 2–6, 2006.

C.V. PARKS, J.C. WAGNER, and D.E. MUELLER, "Full Burnup Credit in Transport and Storage Casks: Benefits and Implementation," *Proceedings of the ANS 2006 International High-Level Radioactive Waste Management Conference*, Las Vegas, Nevada, April 30–May 4, 2006.

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