

Donald E. Mueller

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SUMMARY

Nuclear Engineer (MS) with 29 years' experience in Nuclear Core Reload Design, Nuclear Criticality Safety, and Nuclear Power Plant Training Simulator Engineering

EDUCATION

University of Illinois

Master of Science in Nuclear Engineering, 1984

Thesis: "Background Considerations for a Silicon Detector Operated as a Part of an Alpha Particle Diagnostic System for the Tokamak Fusion Test Reactor"

University of Illinois

Bachelor of Science in Nuclear Engineering, 1983 (highest honors)

Parkland Community College

Associate of Science in Engineering Science, 1981

WORK EXPERIENCE

2004–

Present

Senior R&D Staff

Nuclear Data and Criticality Safety Group; Reactor and Nuclear Systems Division, Oak Ridge National Laboratory, Oak Ridge, TN

Providing general nuclear engineering support and nuclear criticality safety support to the NRC, DOE, ORNL, Sandia National Laboratories (SNL), and other organizations. Support includes:

- Provided support to NRC Office of New Reactors for review of criticality safety for fresh and spent fuel storage for the ESBWR and EPR
- Provided support to NRC Office of Nuclear Reactor Regulation for review of multiple license amendment requests
- Providing NCS support to Spent Fuel Project Office, Office of Nuclear Material Safety and Safeguards, NRC. Provided support for generation of ISG-8, Rev. 3.
- Assisted NRC Office of Nuclear Reactor Regulation revision of Standard Review Plan Section 9.1.1, Criticality Safety of Fresh and Spent Fuel Storage and Handling
- Provided support for generation of reports NUREG/CR-7108 and -7109 addressing validation of burnup credit calculations.
- Prepared reports NUREG/CR-7157 and -7158 on use of extended burnup credit for BWR fuel storage.
- Prepared letter report for the NRC on the potential impacts of introducing thorium into the commercial nuclear fuel cycle.
- Provided evaluation of the French HTC critical experiment data in support of efforts to procure the data for use in the U.S. Providing support for distribution of the HTC critical experiment data
- Created and presented BUC calculation class for/to NRC staff (Nov 2010)
- Provided support for DOE Used Fuel Disposition Project in the areas of (1) evaluating the "self-protection" status of used nuclear fuel stored at U. S. commercial nuclear power plants, and (2) supporting characterization of commercial spent nuclear fuel.
- Providing support to DOE for analysis of Hanford waste tanks.

WORK EXPERIENCE (continued)

- Providing support to the DOE NCS Program for application of sensitivity/uncertainty analysis to critical experiment design
- Provided support to SNL for recertification of the PAT-1 shipping package Provided support for DOE/OCRWM YMP post-closure burnup credit Nuclear Criticality Safety (NCS) work
- Provided support for the DOE/RW Transportation Burnup Credit Project. Support involved applying SCALE criticality and sensitivity analysis sequences to PWR and BWR burnup credit models, processing of commercial spent nuclear fuel data from the DOE Form RW-859 (2002) Nuclear Fuel Data file, evaluation of various burnup credit analysis strategies by comparison of SCALE calculation results with the RW-859 data, and evaluation of critical experiments for use in burnup credit calculation validation
- Assisting with presentation of SCALE training classes
- Significant Event Award (2011) for creation of burnup credit class presented to NRC Staff in October 2010..
- Significant Event Award (2011) for Fukushima- Daiichi analysis support
- Significant Event Award (2013) for work supporting characterization of commercial spent nuclear fuel for the Used Fuel Disposition Project.

1992–

2004 **Nuclear Criticality Safety Specialist**

NCS Staff, Operational Safety Services Division, Oak Ridge National Laboratory, Oak Ridge, TN
Provided qualified (per DOE-approved ORNL NCS Staff Training and Qualification Plan) NCS support as follows for diverse fissionable material operations (e.g., processing, storage, handling, transport, liquid waste and solid waste, legacy burials, etc.):

- Performed and reviewed process evaluations
- Assisted in incorporation of NCS requirements into operating procedures and Nuclear Facility safety basis documents such as DSAs, SARs, BIOS, HSs, PHSs, TSRs, and USQDs
- Performed and reviewed NCS and radiation shielding calculations using SCALE and MCNP
- Performed independent review of CAAS placement MCNP calculations
- Prepared and presented NCS training to workers and supervisors
- Served as the Research Reactors Division Criticality Safety Officer
- Provided on-call emergency response for ORNL Emergency Operations Technical Support Cadre
- Provided criticality safety audit support at ORNL, Y12, and at Fernald
- Provided support for and performed compliance surveys
- Performed initial and quarterly verification of SCALE and MCNP on NCS staff workstations
- ORNL NCS Group Workstation and NCS Software Administrator
- Provided UNIX and programming support to ORNL NCS staff
- Prepared and gave NCS presentations to DOE HQ ES&H, DNFSB Staff, EFCOG and a NCTSP Workshop

1998–

2000 **Nuclear Engineering Consultant**

Provided support for maintaining training simulators at McGuire and Catawba Nuclear Power Stations

1988–

1992 **Sr. Engineer**

Simulator Department, Process Control Division, Westinghouse, Pittsburgh, PA

As a Simulator Engineer, modeled nuclear reactor, incore and excore instrumentation, control rod position and position indication systems, and radiation transport and detection for PWR training simulators. Models were primarily (99%) FORTRAN code. Modeling included interfaces with real control boards and controls in remote cabinets. Models functioned in real-time and simulated transient normal and accident conditions (e.g., LOCA, steam-line break, etc.).

WORK EXPERIENCE (continued)

Project Lead for creation and installation of a “distributed” radioactive material transport and radiation detection model for the V.C. Summer training simulator.

Provided and installed major upgrades to reactor core cycle-specific “tuning” tool (EZTUNE).

Duties also included project engineering functions and a four-month stint as the acting Manager of the Mathematical Modeling Group.

1984–

1988 **Engineer**

Core Engineering Department, Commercial Nuclear Fuels Division (CNFD), Westinghouse, Pittsburgh, PA

Duties were split 50/50 between:

(1) Nuclear reactor core reload design:

- Prepared and reviewed reactor core models for 2-, 3-, and 4-loop Westinghouse PWRs
- Performed safety analysis and prepared documentation
- Generated Nuclear Design Reports. These reports included startup and operating reactor physics predictions and other data used to support operation
- Performed study identifying probable cause of observed reactor core power tilt in a 3-loop Westinghouse PWR. Presented study to Westinghouse management and utility customer

(2) Criticality safety analysis for the storage and handling of nuclear materials

- Implemented calculation methodology and process using KENO IV, XSDRN, NITAWL
- Worked on automation of NCS design calculations
- Trained engineers to perform NCS calculations
- Performed calculations to support safety analysis (fresh & spent fuel storage, consolidated spent fuel storage, burn-up credit for spent fuel storage, fresh fuel transport, and others)
- Prepared criticality analysis reports

1975–

1979 **Sergeant**

United States Marine Corps, Honorable Discharge

PATENTS

- Patent numbers 4,917,856 dated April 17, 1990 and 4,988,473 dated January 29, 1991, “Self-Latching Reactivity-Reducing Device for Use in On-Site Spent Fuel Assembly Storage.”
- Patent number 5,232,657 dated August 3, 1993, “Metal Hydride Flux Trap Neutron Absorber Arrangement for a Nuclear Fuel Storage Body.”

PROFESSIONAL AFFILIATIONS

American Nuclear Society (ANS), member

Member of working group on ANSI/ANS-8.27 standard on Burnup Credit

PUBLICATIONS

D.E. Mueller, J. M. Scaglione, J. C. Wagner, and S. M. Bowman, *Computational Benchmark for Estimated Reactivity Margin from Fission Products and Minor Actinides in BWR Burnup Credit*, NUREG/CR-7157 (ORNL/TM-2012/96), U. S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, February 2013.

D.E. Mueller, S. M. Bowman, W. J. Marshall, and J. M. Scaglione, *Review and Prioritization of Technical Issues Related to Burnup Credit for BWR Fuel*, NUREG/CR-7158 (ORNL/TM-2012/261), U. S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, February 2013.

J. C. Wagner et al. (includes **D. E. Mueller**), *Categorization of Used Nuclear Fuel Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy*, ORNL/TM-2012/308, FCRD-FCT-2012-000232, Oak Ridge National Laboratory, December 2012.

G. T. Mays et al. (includes **D. E. Mueller**), *Application of Spatial Data Modeling Systems, Geographical Information Systems (GIS), Transportation Routing Optimization Methods for Evaluating Integrated Deployment of Interim Spent Fuel Storage Installations and Advanced Nuclear Plants*, ORNL/TM-2012/237, Oak Ridge National Laboratory, Oak Ridge, Tenn., June 2012.

J. M. Scaglione, **D. E. Mueller**, J. C. Wagner, W. J. Marshall, *An Approach for Validating Actinide and Fission Product Burnup Credit Criticality Safety Analyses – Criticality (k_{eff}) Predictions*, NUREG/CR-7109 (ORNL/TM-2011/514), U. S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, April 2012.

B. T. Rearden, D. A. Reed, R. A. Lefebvre, **D. Mueller**, and W. J. Marshall, “Scale/TSUNAMI Sensitivity Data for ICSBEP Evaluations,” *Proceedings of ICNC 2011*, Edinburgh, Scotland, September 19-23, 2011.

J. M. Scaglione, **D. Mueller**, and J. C. Wagner, “An Approach for Validating Actinide and Fission Product Burnup Credit Criticality Safety Analyses--Criticality (k_{eff}) Predictions,” *Proceedings of ICNC 2011*, Edinburgh, Scotland, September 19-23, 2011.

B. T. Rearden and **D. Mueller**, “Uncertainty Quantification Techniques of SCALE/TSUNAMI,” *Trans. Am. Nucl. Soc.* **104**, 371-373 (2011).

V. Sobes, L. C. Leal, H. Derrien, D. Wiarda, **D. Mueller**, and B. Forget, “Processing and Testing New ^{240}Pu Resolved Resonance Evaluation,” *Trans. Am. Nucl. Soc.* **104**, 780-782 (2011).

C. V. Parks, J. C. Wagner, **D. Mueller**, and I. C. Gauld, “Development of Technical Basis for Burnup Credit Regulatory Guidance in the United States,” *Proceedings of PATRAM 2010*, London, U.K., October 3-8, 2010.

B. T. Rearden and **D. Mueller**, “Bias Assessment of ^{233}U Systems Using SCALE TSURFER,” *Trans. Am. Nucl. Soc.* **102**, 307-311 (2010).

A. D. Barber and **D. Mueller**, “Direct Perturbation Calculation for TSUNAMI Sensitivity Coefficient Validation,” *Trans. Am. Nucl. Soc.* **102**, 281-282 (2010).

D. Mueller and B. T. Rearden, “SCALE TSUNAMI Analysis of Critical Experiments for Validation of ^{233}U Systems,” *Trans. Am. Nucl. Soc.* **101**, 455-457 (2009).

D. E. Mueller, B. T. Rearden and D. A. Reed, “Evaluation of Fission Product Critical Experiments and Associated Biases for Burnup Credit Validation,” International Workshop on Advances in Applications of Burnup Credit for Spent Fuel Storage, Transport, Reprocessing, and Disposition, Cordoba, Spain, October 2009.

J. C. Wagner, C. V. Parks, **D. E. Mueller**, and I. Gauld, “Review of Technical Studies in the United States in Support of Burnup Credit Regulatory Guidance,” International Workshop on Advances in Applications of Burnup Credit for Spent Fuel Storage, Transport, Reprocessing, and Disposition, Cordoba, Spain, October 2009.

PUBLICATIONS (continued)

J. A. Roberts, P. P. H. Wilson, and **D. E. Mueller**, "Further Interpretation of Sensitivity Data in Support of Burnup Credit," *Proceedings of the 2009 Nuclear Criticality Safety Division Topical Meeting on Realism, Robustness and the Nuclear Renaissance*, Richland, Washington, September 2009.

G. Radulescu, **D. E. Mueller**, and J. C. Wagner, "Sensitivity and Uncertainty Analysis of Commercial Reactor Criticals for Burnup Credit," *Nucl. Technol.* **167**(2), 268-287, August 2009.

D. E. Mueller, B. T. Rearden, and D. F. Hollenbach, *Application of the SCALE TSUNAMI Tools for the Validation of Criticality Safety Calculations Involving ²³³U*, ORNL/TM-2008/196, Oak Ridge National Laboratory, Oak Ridge, Tenn., January 2009.

B. T. Rearden, **D. E. Mueller**, S. M. Bowman, R. D. Busch, and S. J. Emerson, *TSUNAMI Primer: A Primer for Sensitivity/Uncertainty Calculations with SCALE*, ORNL/TM-2009/027, Oak Ridge National Laboratory, January 2009.

D. E. Mueller and B. T. Rearden, "Using Cross-Section Uncertainty Data to Estimate Biases," *Trans. Am. Nucl. Soc.* **99**, 389-390 (2008).

J. A. Roberts and **D. E. Mueller**, "Designing Critical Experiments in Support of Full Burnup Credit," *Trans. Am. Nucl. Soc.* **99**, 391-393 (2008).

L. Leal, **D. Mueller**, G. Arbanas, D. Wiarda, and H. Derrien, "Impact of the ²³⁵U Covariance Data In Benchmark Calculations," in *Proceedings of the International Conference on the Physics of Reactors (PHYSOR '08), "Nuclear Power: A Sustainable Resource,"* Casino-Kursaal Conference Center, Interlaken, Switzerland, September 14-19, 2008.

D. E. Mueller, K. R. Elam, and P. B. Fox, *Evaluation of the French Haut Taux de Combustion (HTC) Critical Experiment Data*, NUREG/CR-6979 (ORNL/TM-2007/083), prepared for the U.S. Nuclear Regulatory Commission by Oak Ridge National Laboratory, Oak Ridge, Tenn., September 2008.

B. T. Rearden and D. E. Mueller, "Recent Use of Covariance Data for Criticality Safety Assessment," *Nuclear Data Sheets* **109**, 2739-2744 (2008).

D. E. Mueller, "Evaluation of the HTC Critical Experiment Data," *Trans. Am. Nucl. Soc.* **98**, 219-222 (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), prepared for the U.S. Nuclear Regulatory Commission by Oak Ridge National Laboratory, Oak Ridge, Tenn., December 2007.

L. C. Leal, H. Derrien, M. E. Dunn, and **D. E. Mueller**, *Assessment of Fission Product Cross-Section Data for Burnup Credit Applications*, ORNL/TM-2005/65, Oak Ridge National Laboratory, Oak Ridge, Tenn., December 2007.

G. Radulescu, **D. E. Mueller**, and J. C. Wagner, "Evaluation of Applicability of CRC Models for Burnup Credit Validation," *Trans. Am. Nucl. Soc.* **97**, 151-153 (2007).

E. D. Blakeman, D. E. Peplow, 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.

PUBLICATIONS (continued)

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).

S. N. Williams and **D. E. Mueller**, "Survey of Operating Parameters for Use in Burnup Credit Calculations," *Trans. Am. Nucl. Soc.* **95**, 269-273 (2006).

D. E. Mueller and G. A. Harms, "Using the SCALE 5 TSUNAMI-3D Sequence in Critical Experiment Design," *Trans. Am. Nucl. Soc.* **93**, 263-266 (2005).

D. E. Mueller and B. T. Rearden, "Sensitivity Coefficient Generation for a Burnup Credit Cask Model using TSUNAMI-3D," presented at the 2005 NCS D Topical Meeting, Knoxville, TN, September 19-22, 2005.

J. C. Wagner and **D. E. Mueller**, "Updated Evaluation of Burnup Credit for Accommodating PWR Spent Nuclear Fuel to High-Capacity Cask Designs," presented at the 2005 NCS D Topical Meeting, Knoxville, TN, September 19-22, 2005.

D. E. Mueller and J. C. Wagner, "Application of Sensitivity/Uncertainty Methods to Burnup Credit Criticality Validation," presented at 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," presented at 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.

I. C. Gauld and **D. E. Mueller**, *Evaluation of Cross-Section Sensitivities in Computing Burnup Credit Fission Product Concentrations*, ORNL/TM-2005/48, Oak Ridge National Laboratory, Oak Ridge, Tenn., August 2005.

D. A. Reed, A. W. Krass, and **D. E. Mueller**, "Criticality Index Determination for Transport of a Non-DOT Package of U(2.75)O₂," Oak Ridge National Laboratory, May 2004.

D. A. Reed, **D. E. Mueller**, and R. G. Taylor, "Processing of Nuclear Ship Savannah Fuel," presented at 2004 ANS Annual meeting in Pittsburgh, June 2004.

D. E. Mueller, "Nuclear Criticality Safety at Oak Ridge National Laboratory," invited paper/presentation for the Eleventh Annual Energy Facilities Contractors Group (EFCOG) Safety Analysis Working Group (SAWG) Workshop, Milwaukee, WI, June 14-21, 2001.

D. E. Mueller, C. M. Hopper, and E. C. Crume, "MSRE Remediation or A Criticality Carol," presented at DOE NCTSP Workshop at Gaithersburg, MD, May 15, 1996.

R. L. Simmons, N. D. Jones, F. D. Popa, **D. E. Mueller**, and J. E. Pritchett, "Integral Fuel Burnable Absorbers with ZrB₂ in Pressurized Water Reactors," *Nucl. Technol.* **80**, 343-348, March 1988.

D. E. Mueller and W. A. Boyd, "Qualification of KENO Calculations with ENDF/B-V Cross Sections," *ANS Transactions* **56**, 321-322, 1988.

W. A. Boyd and **D. E. Mueller**, "Effects of Poison Panel Shrinkage and Gaps on Fuel Storage Rack Reactivity," *ANS Transactions* **56**, 1988, 323-324, 1988.

J. E. Pritchett and **D. E. Mueller**, "Operational Experience with ZrB₂ Integral Fuel Burnable Absorbers," *ANS Transactions* **55**, 117-118, 1987.

PUBLICATIONS (continued)

R. L. Simmons, N. D. Jones, J. E. Pritchett, **D. E. Mueller**, and F. D. Popa, "Integral Fuel Burnable Absorbers with ZrB₂ in Pressurized Water Reactors," *ANS Transactions* 53, 88-89, 1986.

G. Gerdin, **D. E. Mueller**, and B. W. Wehring, "Charge Neutralization by Foils to Study Alpha Edge Flux Produced in a Magnetic Fusion Reactor," *Fusion Technol.* 7, 180-196, March 1985.

G. Gerdin, B. Wehring, T. Blue, **D. E. Mueller**, and D. Femia, "Charge Conversion Foil Approach to Observation of Alpha Orbit Losses," presented at the Alpha Particle Workshop, Oak Ridge National Laboratory, Knoxville, TN, February 22-23, 1984.

D. E. Mueller, "Background Considerations for a Silicon Detector Operated as a Part of an Alpha Particle Diagnostic System for the Tokamak Fusion Test Reactor," *M.S. Thesis*, University of Illinois, Nuclear Engineering (1984).

D. E. Mueller, G. Gerdin, B. W. Wehring, T. Emoto, and T. Blue, "A Passive Approach to Measurement of Alpha Particle Energies in TFTR," *Bull. Am. Phys. Soc.* 28, 1071, October 1983.