

March 1, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

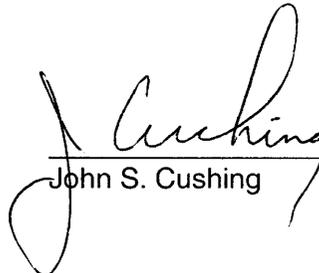
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
DOMINION NUCLEAR NORTH ANNA, LLC) Docket No. 52-008-ESP
)
(Early Site Permit for North Anna ESP Site))

AFFIDAVIT OF JOHN S. CUSHING CONCERNING THE NRC STAFF RESPONSE
TO THE BOARD'S ENVIRONMENT-RELATED QUESTIONS

I, John S. Cushing, do hereby state as follows:

1. I am a Senior Environmental Project Manager in the Nuclear Regulatory Commission's ("NRC") Office of New Reactors ("NRO"), Division of Site and Environmental Reviews ("DSEER"). I am the NRC Project Manager for the environmental review of the Dominion Nuclear North Anna, LLC application for an early site permit ("ESP") at the North Anna ESP site near Mineral, Virginia. A statement of my professional qualifications is attached.
2. I was responsible for overseeing the preparation of NUREG-1811, the "Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," December 2006.
3. I am responsible for those responses to Board questions (or portions of questions) in Attachment A to the "NRC Staff Legal Brief in Response to the Licensing Board's Environment-Related Questions" for which I am listed as the author.
4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.



John S. Cushing

**STATEMENT OF PROFESSIONAL QUALIFICATIONS OF
JOHN S. CUSHING
JANUARY 2007**

QUALIFICATIONS

Mr. Cushing has more than 24 years of environmental, licensing, and operating experience in the commercial nuclear power industry. The 24 years includes eight years of regulatory experience with the NRC and 16 years of operating experience as both an auxiliary operator and a licensed reactor operator with the Maine Yankee Nuclear Power Plant.

Since joining the U.S. Nuclear Regulatory Commission (NRC) in 1998, Mr. Cushing has been a project manager (PM) for a diverse set of licensing and operating reactor projects. His present position with the NRC is as a senior environmental PM for the North Anna Early Site Permit (ESP) review. He also managed reviews as the environmental PM for the Farley Nuclear Plant and the Fort Calhoun Station license renewal, license renewal safety PM for the Ginna Station review, PM for the Columbia Generating Station (CGS), and PM for the Combustion Engineering Owners Group.

His professional experience required coordinating the licensing reviews for operating nuclear power facilities, safety and environmental license renewal reviews, topical report reviews, and environmental early site permit reviews. These reviews required him to be acquainted with a broad spectrum of technical areas related to the construction and operation of nuclear power facilities.

EDUCATION AND LICENSES

B.S. Massachusetts Maritime Academy, Marine Engineering	1979
United States Coast Guard License Second Assistant Engineer	1981-1992
Reactor Operator License Maine Yankee	1986 -1997

CURRENT POSITION

Senior Environmental Project Manager for the Dominion Early Site Permit (ESP) Application Review (April 2004 -Present).

Mr. Cushing is responsible for the overall coordination of the National Environmental Policy Act (NEPA) review of the Dominion ESP application. In general, his responsibilities have included coordinating the development and issuance of requests for additional information, the Draft Environmental Impact Statement (DEIS), the Supplement to the DEIS (SDEIS) and the Final Environmental Impact Statement. In this capacity he coordinated the reviews of the NRC technical staff and their contractors who independently evaluated the environmental impacts of constructing and operating a nuclear power facility. His duties included conducting public meetings to provide information to public and to solicit comments on the scope of the review and on the DEIS and SDEIS. In addition he coordinated the disposition of public comments and interfaced with local, State, Tribal and Federal officials regarding the NEPA review.

PAST PROJECTS

1. Environmental Project Manager for License Renewal Application Environmental Reviews October 2002-March 2005

Mr. Cushing was responsible for the overall coordination of the National Environmental Policy Act (NEPA) review of license renewal applications for the Fort Calhoun Station and the Farley Nuclear Plant. In this capacity, he coordinated the reviews of the technical staff and their contractors who independently evaluated the impacts of operating a nuclear power facility for 20 years beyond the original operating license term. His duties included conducting public meetings to provide information to public and to solicit comments on the scope of the review and on the DEIS and SDEIS. In addition he coordinated the disposition of public comments and interfaced with local, State, Tribal and Federal officials regarding the NEPA review including coordinating consultation with State and Federal agencies under the Endangered Species Act and the National Historic Preservation Act.

2. Safety Project Manager for Ginna License Renewal Application Review July 2002-October 2002

Mr. Cushing was responsible for coordinating the safety review for the license renewal application for the R.E. Ginna Nuclear Power Plant. In this capacity, he coordinated the review of the technical staff who evaluated the programs and actions necessary to manage the aging affects for 20 years beyond the original operating license term.

3. Project Manager for the Combustion Engineering Owners Group October 1999-June 2002

Mr. Cushing was responsible for coordinating the reviews of topical reports for the Combustion Engineering designed plants that comprised the owners group. The topical reports provided the technical basis for changes to the design or operating basis for a common group of plants.

4. Project Manger for the Columbia Generating Station April 1999-June 2002

As the Project Manager, Mr. Cushing served as the headquarters focal point for all activities related to his plant. In this regard, the PM performs two primary functions. First, the PM maintains the design basis for his plant, including the Final Safety Analysis Report, technical specifications and the Operating License. Second, the PM supports the region in monitoring the licensee's onsite activities and performance. In this capacity, Mr. Cushing was responsible for issuing various license amendments, relief requests and exemptions.

5. Project Manager Division of Licensing Project Management April 1998-April 1999

Assisted other project managers on a variety of projects during first year with the NRC.

6. Operator Maine Yankee 1982-1998

Mr. Cushing, was both an auxiliary operator and a licensed reactor operator at Maine Yankee. The NRC requirements for the knowledge, skills and abilities for a reactor operator are specified in 10 CFR 55.41. His responsibilities included the safe operation of commercial nuclear power plant during refueling, plant during heatup, taking the reactor critical, low power physics testing, and power operations.

7. Third Assistant Engineer American Steamship Company 1979-1981

Mr. Cushing was a Third Assistant Engineer aboard the *Indiana Harbor*, a 1,000 foot ore carrier on the Great Lakes. Mr. Cushing was responsible for operating and maintaining the engine room while on watch.

Key Publications

The following NRC publications are those for which Mr. Cushing was the principal Project Manager and coordinator for the publication or had significant input to the document.

Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site, NUREG -1811, December 2006.

Supplement 18 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Joseph M. Farley Nuclear Plant, Units 1 and 2, NUREG -1437, March 2005.

Office of Nuclear Reactor Regulation Office Instruction LIC-201, Revision 1, NRR Support to the Hearing Process, September 2004.

Interim Staff Guidance Process. December 12, 2003.

Supplement 12 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Fort Calhoun Station, Unit 1, NUREG - 1437, August 2003.

Office of Nuclear Reactor Regulation Office Instruction LIC-500, Processing Requests for Reviews of Topical Reports, August 2001.

Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Topical Report CE NPSD -1184, Joint Application Report for DC Power Sources Allowed Outage Time Extension Project No. 692, May 2001.

Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Topical Report CE NPSD - 683 Revision 6, Development of a RCS Pressure and Temperature Limits Report for the Removal of P-T limits and LTOP Requirements From the Technical Specifications" Project No. 692, March 2001.

Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Topical Report CENPD-132, Supplement 4-P, Revision 1, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model" Project No. 692, January 2001.

Safety Evaluation by the Office of Nuclear Reactor Regulation related to the Combustion Engineering Owners Group Joint Application Report, CENPD -1157, Revision 1, "Technical Justification for Elimination of the Post Accident Sampling System From Plant Design and Licensing Bases for CEOG Utilities, July 2000.

Safety Evaluation by the Office of Nuclear Reactor Regulation CE Nuclear Power Topical Report CENPD-396-P "Common Qualified Platform" Project No. 692, August 2000.

Safety Evaluation by the Office of Nuclear Reactor Regulation, Related to Combustion Engineering Owners CE NPSD -1168, "Joint Application for Containment Isolation Valve AOT [allowed outage time] Extension, June 2000

March 1, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
DOMINION NUCLEAR NORTH ANNA, LLC)	Docket No. 52-008-ESP
)	
(Early Site Permit for North Anna ESP Site))	

AFFIDAVIT OF CHRISTOPHER B. COOK CONCERNING THE NRC STAFF
RESPONSE TO THE BOARD'S ENVIRONMENT-RELATED QUESTIONS

I. Christopher B. Cook, do hereby state as follows:

1. I am employed as a Senior Research Engineer with the Hydrology Group at the Pacific Northwest National Laboratory, managed by Battelle Memorial Institute's Pacific Northwest Division. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.
2. As part of the NRC staff's environmental review of the North Anna ESP application, documented in NUREG-1811, the "Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," December 2006, I assisted the NRC staff in its analysis of the aspects of the applicant's Environmental Report that concerned hydrology and water use.
3. I am responsible for those responses to Board questions (or portions of questions) in Attachment A to the "NRC Staff Legal Brief in Response to the Licensing Board's Environment-Related Questions" for which I am listed as the author.

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.



Christopher B. Cook

RÉSUMÉ

CHRISTOPHER B. COOK

Senior Research Engineer
Hydrology Group
Environmental Technology Division
Pacific Northwest National Laboratory

EDUCATION

Ph.D., Civil and Environmental Engineering, University of California at Davis, 2000
M.S., Civil and Environmental Engineering, University of California at Davis, 1993
B.S., Civil Engineering, Colorado State University, 1991

PROFESSIONAL EXPERIENCE

Dr. Cook is a Senior Research Engineer working with the Hydrology Group since 2000. His professional experience at the Pacific Northwest National Laboratory includes basic and applied research in the area of environmental fluid mechanics. Past research has focused on multi-dimensional hydrodynamic and water quality modeling of surface water systems, including the use of three-dimensional computational fluid dynamics (CFD) models. Specific areas of expertise include: application of free-surface CFD models to hydroelectric structures, simulating complex density driven flows in stratified environments, and instrumentation relevant to environmental fluid mechanics. Selective project experience includes the following:

Simulation of 3-D Free-Surface Hydrodynamics near Hydraulic Structures – Dr Cook has participated in and lead several CFD modeling projects to compute water velocities, turbulence intensities, and pressure variations (including hydraulic loads) to assist the US Army Corps of Engineers re-design various hydraulic structures at hydroelectric dams. Several relevant examples are: a) Bonneville Second Powerhouse Ice and Trash Sluiceway, b) potential re-designs of the spillway at The Dalles Dam and c) flow characteristics upstream of the tainter gates at John Day and The Dalles Dam. These three projects have involved validation against physical model and prototype field data, and structures have been constructed based in part upon results from these CFD simulations.

Field Assessment and Simulation of Temperature Fluctuations in the Lower Snake River – Dr Cook is currently leading a multi-year project to monitor and model temperature fluctuations in the Lower Snake River. Numerical simulations include the application of numerical models to simulate transient three-dimensional density currents at the confluence of the Clearwater and Snake Rivers, and a two-dimensional laterally-averaged model to simulate temperature variations throughout the 140 mile reach downstream to the confluence of the Snake and Columbia Rivers. In situ measurements in the confluence region have focused on density gradients and their impacts on fish migration, and include the use of: self-contained temperature loggers, acoustic Doppler current profilers (water velocity), and satellite based multi-spectral imagery.

In-Situ Characterization of Mean and Turbulent Flows – Dr. Cook has deployed and analyzed data from numerous acoustic Doppler current profilers (ADCP) studies to observe the mean and turbulent flow conditions. These have included routine discharge and point velocity profile

measurements, and the more sophisticated use of beam coordinate measurements in heterogeneous environment. Utilization of beam coordinate data provides validation data for CFD models that is typically not available.

Simulation of Deep Intake Structures at High Head Dams – Dr Cook lead a three-dimensional CFD modeling study to compute the flow field upstream of the low level regulating outlets at Dworshak Dam, North Fork Clearwater River, Idaho. Numerical simulations were performed using the CFD model Flow-3D. Results were studied to determine the impacts of water surface elevation and discharge through the three regulating outlets on flow velocities in the reservoir forebay near the intake.

Three-Dimensional Hydrodynamic and Water Quality Simulation of a Terminal Basin Lake – While at the University of California at Davis (UCD), Dr. Cook applied the multi-dimensional finite element model RMA10 to the Salton Sea, California. To calibrate and verify the model, a team lead by Dr. Cook implemented a year-long field data monitoring program to obtain *in situ* water current (ADCP) and quality (e.g. temperature, salinity, pH, and dissolved oxygen) information. Applications of the computational model have focused on management alternatives to restore the Sea's degrading saline environment.

PUBLICATIONS AND TECHNICAL REPORTS

Cook, CB, MC Richmond, and JA Serkowski. 2007. Observations of Velocity Conditions near a Hydroelectric Turbine Draft Tube Exit using ADCP Measurements, Journal of Flow Measurement and Instrumentation, accepted with minor revisions.

Cook, CB, B Dibrani, JA Serkowski, MC Richmond, PS Titzler, and GW Dennis. 2006. Acoustic Doppler Current Profiler Measurements in the Tailrace at John Day Dam, PNNL-15627, Pacific Northwest National Laboratory, Richland, WA, January.

Cook, CB, B Dibrani, MC Richmond, MD Bleich, SP Titzler, and T Fu. 2006. Hydraulic Characteristics of the Lower Snake River during Periods of Juvenile Fall Chinook Salmon Migration, PNNL-15532, Pacific Northwest National Laboratory, Richland, WA, January.

Johnson GE, ME Hanks, F Khan, CB Cook, J Hedgepeth, RP Mueller, CL Rakowski, MC Richmond, SL Sargeant, JA Serkowski, and JR Skalski. 2005. Hydroacoustic Evaluation of Juvenile Salmonid Passage at The Dalles Dam in 2004 . PNNL-15180, Pacific Northwest National Laboratory, Richland, WA.

Johnson RL, MA Simmons, CA McKinstry, CS Simmons, CB Cook, RS Brown, DK Tano, SL Thorsten, R LeCaire, and S Francis. 2005. Strobe Light Deterrent Efficacy Test and Fish Behavior Determination at Grand Coulee Dam Third Powerplant Forebay – Final Report. PNNL-15007, Pacific Northwest National Laboratory, Richland, WA, February.

Cook CB, LW Vail, and DL Ward. 2005. Report on the North Anna Early Site Permit Water Budget Model (LakeWBT) for Lake Anna. PNNL-14944, Pacific Northwest National Laboratory, Richland, WA, January.

Cook C.B, M.C. Richmond, and J.A. Serkowski. 2005. Spillway Improvement Study for The Dalles Dam, Columbia River, PNNL-14768, Pacific Northwest National Laboratory, Richland, WA.

Cook C.B and M.C. Richmond. 2004. Simulating the Flow Field Upstream of the Dworshak Dam Regulating Outlets, PNNL-14591, Pacific Northwest National Laboratory, Richland, WA, March.

Cook, C.B. and M.C. Richmond. 2004. Monitoring and Simulating 3-D Density Currents at the Confluence of the Snake and Clearwater Rivers, in Critical Transitions in Water and Environmental Resources Management, edited by G. Schike, D. Hayes and D. Stevens, American Society of Civil Engineering Press, 2004.

Simmons M, RL Johnson, CA McKinstry, CS Simmons, CB Cook, RS Brown, DK Tano, SL Thorsten, R LeCaire, and S Francis. 2004 Strobe Light Deterrent Efficacy Test and Fish Behavior Determination at Grand Coulee Dam Third Powerplant Forebay . PNNL-14512, Pacific Northwest National Laboratory, Richland, WA, January.

Cook C.B., C.L. Rakowski, M.C. Richmond, S.P. Titzler, A.M. Coleman, M.D. Bleich. 2003. Numerically Simulating the Hydrodynamic and Water Quality Environment for Migrating Salmon in the Lower Snake River, PNNL-14297, Pacific Northwest National Laboratory, Richland, WA.

Johnson R.L., M.A. Simmons, C.A. McKinstry, C.B. Cook, C.S. Simmons, S.L. Thorsten, R. LeCaire, S. Francis (2003) Strobe Light Deterrent Efficacy Test and Fish Behavior Determination at Grand Coulee Dam Third Powerplant Forebay. PNNL-14177, Pacific Northwest National Laboratory, Richland, WA.

Ploskey G.R., C.B. Cook, S.P. Titzler, R.A. Moursund (2002) Optimization of Hydroacoustic Deployments at John Day Dam. PNNL-14062, Pacific Northwest National Laboratory, Richland, WA.

Olivares DD, and CB Cook. 2002. Analyzing the Water Quality Environment for Migrating Salmon in the Lower Snake River. PNNL-14021, Pacific Northwest National Laboratory, Richland, WA.

University of Redlands, eds. (2002) Salton Sea Atlas, contributor to Limnology Chapter, ESRI press, Redlands, Ca.

C.B. Cook, G.T. Orlob, and D.W. Huston (2002). *Simulation of Wind-Driven Circulation in the Salton Sea: Implications for Indigenous Ecosystems*, Hydrobiologia, **473**: 59-75.

C.B. Cook and R.L. Johnson (2001) *Analysis of Observed Water Velocities at Bonneville Dam: Unit 8 (FGE)*, Letter Report, Pacific Northwest National Laboratory, 29 pgs..

C.B. Cook and R.L. Johnson (2001) *Analysis of Observed Water Velocities at Bonneville Dam: Unit 3 (PSC)*, Letter Report, Pacific Northwest National Laboratory, 30 pgs.

C.B. Cook and M.C. Richmond (2001) *Simulation of Tailrace Hydrodynamics using Computational Fluid Dynamics Models*, PNNL-13467, Pacific Northwest National Laboratory, 35 pgs.

C.B. Cook, M.C. Richmond, G. R. Guensch (2001) *Bonneville Second Powerhouse Tailrace and High Flow Outfall: ADCP and drogue release field study*, PNNL-13403, Pacific Northwest National Laboratory, 25 pgs.

C.B. Cook, M.C. Richmond, J.A. Serkowski (2000) *Free-Surface Hydrodynamics and Fish Behavior Simulations for Hydroelectric Projects*, Laboratory Directed Research and Development Report, Pacific Northwest National Laboratory, 7 pgs.

C.B. Cook, G.T. Orlob (2000). *Numerical Estimation of Dynamic Water Temperature Fluctuations at Compliance Point Robinson Riffle (Feather River, California)*, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, University of California, Davis, 31 pgs.

C.B. Cook (2000). *Internal Dynamics of a Terminal Basin Lake: A Numerical Model for Management of the Salton Sea*, Ph.D. dissertation, Department of Civil and Environmental Engineering, University of California, Davis.

C. B. Cook, G.T. Orlob, D.W. Huston (2000). *Internal Dynamics of the Salton Sea: A Three-Dimensional Numerical Model for Management*, Report 00-3, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, University of California, Davis, 212 pgs.

D.W. Huston, G.T. Orlob, and C.B. Cook (2000). *Internal Dynamics of the Salton Sea: Wind Field Analysis in Support of Hydrodynamic Modeling*, Report 00-4, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, University of California, Davis, 152 pgs.

Huston D.W., C.B. Cook, and G.T. Orlob (1999). *New and Alamo Rivers Project: Preliminary Data Collection and Analysis for Development of Hydrodynamic and Water Quality River Models*, Report 99-3, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, University of California, Davis.

Cook C.B., G.T. Orlob, T. Sommer (1999). *Modeling Temperature Fluctuations in the Lower Feather River*, IEP Newsletter, Interagency Ecological Program for the Sacramento-San Joaquin Estuary, 12(4), pgs. 42-46, Fall.

Cook C.B., D.W. Huston, G.T. Orlob, I. K. King, and S.G. Schladow (1998). *Salton Sea Project Final Report*, Report 98-2, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of California, Davis, August, 109 pgs.

Cook C.B., M.R. Jensen, D.W. Huston, G.T. Orlob, S.G. Schladow (1997). *Salton Sea Project Phase II-A Report: Data Collection for Calibration and Verification of Computational Models*, Modeling Group, Center for Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of California, Davis, May, 24 pgs.

Deas M.L., C.L. Lowney, G.K. Meyer, J.D. Anderson, C.B. Cook, J.J. Fellous, M.M. Kirkland, X. Wang, G.T. Orlob, I.P. King (1997). *Sacramento River Temperature Modeling Project*, Sponsored by the California State Water Resources Control Board 205j Clean Water Act Grant Program, the Trinity County Planning Department, and the California Department of Fish and Game Proposition 70 Salmon Stream Restoration Fund. January.

Cook, C. B. , J.D. Anderson, J. J. Fellos, G. T. Orlob (1995). *Salton Sea Project: Phase I Final Report*, Modeling Group, Center for Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of California-Davis, September, 42 pgs.

McKenzie River Temperature Study (1993), Hydrologic Engineering Center for Portland District USACE, HEC Report 93-1, September.

Abt S.R., C.B. Cook, K. Staker, and D. Johns (1991). *Small Parshall Flume Rating Corrections*, ASCE Journal of Hydraulic Engineering, 118(5), pp. 798-802.

PROCEEDINGS PAPERS

Prasad R, LW Vail, CB Cook, and G Bagchi. 2005. "Establishment of Safety-Related Site Characteristics Based on Consideration of External Sources of Flooding at Nuclear Power Plant Sites in the United States of America." In Proceedings of International Workshop on External Flooding Hazards at Nuclear Power Plant Sites, Kalpakkam, India, August.

Cook CB, GG He, DL Ward, A Coleman, and WA Perkins. 2003. "Quantifying Thermal Variations in Lower Granite Reservoir using Satellites and 3-D CFD." Hydrogeology of Washington State, Tacoma, WA, April 2003. PNNL-SA-38448, Pacific Northwest National Laboratory, Richland, WA.

C.B. Cook, M.C. Richmond, J.A. Serkowski, L.L. Ebner (2002) *Free-Surface Computational Fluid Dynamics Modeling of a Spillway and Tailrace: Case Study of The Dalles Project*, Hydrovision 2002, Portland, Oregon, July.

G.R. Guensch, C.B. Cook, M.C. Richmond, L.L. Ebner (2002) *Hydrodynamic Study of the Bonneville Second Powerhouse Tailrace using Drogue Releases and ADCP Measurements*, Hydrovision 2002, Portland, Oregon, July.

Cook C.B., G.T. Orlob, D.W. Huston (2000). *Three-Dimensional Hydrodynamic Modeling of the Salton Sea*, Salton Sea Symposium, January.

Cook C.B., D.W. Huston, M.R. Jensen, G.T. Orlob, S.G. Schladow (1998). *Internal Dynamics of a Large Saline Lake: Field Investigation and Monitoring of the Salton Sea, California*, 1998 Ocean Sciences Meeting, AGU and ASLO, February.

Cook C.B., and G.T. Orlob (1998). *Temperature Prediction in the Lower Feather River*, Wetlands Engineering and River Restoration Conference, American Society of Civil Engineers, March.

Cook C.B. and G.T. Orlob (1997). *Field Monitoring and Hydrodynamic Modeling of the Salton Sea, CA*, Environmental and Coastal Hydraulics: Protecting the Aquatic Habitat, Vol. 1, 27th Congress of the International Association for Hydraulic Research, August, pp 659-664.

Cook C.B. and G.T. Orlob (1996). *Two- and Three-Dimensional Modeling of Salton Sea, California*, Proceedings of the North American Water and Environment Congress, American Society of Civil Engineers, June, 6 pgs.

Abt S.R., C.B. Cook, K. Staker, and R. Belt (1991). *Small Parshall Flume Rating Correction for Settlement*, Proceedings of the Colorado Water Engineering and Management Conference, February, pp 231-237.

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
American Fisheries Society
American Geophysical Union
Tau Beta Pi

PROFESSIONAL COMMITTEES AND ACTIVITIES

Reviewer for the ASCE Journal of Water Resources Planning and Management, ASCE Journal of Hydrologic Engineering, ASCE Journal of Hydraulic Engineering, and ASCE Journal of Irrigation and Drainage.

PROFESSIONAL REGISTRATION

Engineer-in-Training, State of Colorado, Certificate No. 17481, 1991.

March 1, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

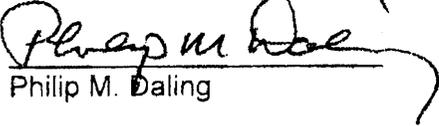
In the Matter of)	
)	
DOMINION NUCLEAR NORTH ANNA, LLC)	Docket No. 52-008-ESP
)	
(Early Site Permit for North Anna ESP Site))	

AFFIDAVIT OF PHILIP M. DALING CONCERNING THE NRC STAFF
RESPONSE TO THE BOARD'S ENVIRONMENT-RELATED QUESTIONS

I, Philip M. Daling, do hereby state as follows:

1. I am employed as a Staff Engineer with the Facility Safety Group at the Pacific Northwest National Laboratory, managed by Battelle Memorial Institute's Pacific Northwest Division. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.
2. As part of the NRC staff's environmental review of the North Anna ESP application, documented in NUREG-1811, the "Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," December 2006, I assisted the NRC staff as the Technical Lead that provided input to the FEIS in its analysis of the aspects of the applicant's Environmental Report that concerned the impacts of transportation of unirradiated fuel, spent fuel, and radioactive waste.
3. I am responsible for those responses to Board questions (or portions of questions) in Attachment A to the "NRC Staff Legal Brief in Response to the Licensing Board's Environment-Related Questions" for which I am listed as the author.

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.


Philip M. Daling

PHILIP M. DALING - Staff Engineer
Facility Safety Group
Environment, Safety, Health, and QA Department
Pacific Northwest National Laboratory

Education

B.S. Physical Metallurgy, Washington State University (1981)

Summary of Experience

Mr. Daling's experience involves work in several fields. Job responsibilities have included radioactive and hazardous material processing safety analysis; radioactive materials transportation safety, risk, and cost analysis; radioactive waste management safety and economics; nuclear reactor system safety and risk analysis; mine systems safety analysis; and risk-based decision management. Following are descriptions that exemplify his responsibilities in these areas.

Mr. Daling is a task leader and key technical contributor to the NRC's Spent Fuel Project Office reviews of spent fuel storage and transportation cask licensing submittals (SARs and SARPs). Mr. Daling's responsibilities include independent technical review and confirmatory calculations of several sections of the licensee submittals, including the accident analysis, operating procedures, and technical specifications for storage casks and the containment evaluation, operating procedures, and technical specifications chapters of transportation cask submittals. He has participated in reviews, preparation of Requests for Additional Information, communication with licensees and NRC staff, and preparing the related sections of the NRC Safety Evaluation Reports that were developed based on the reviews.

Mr. Daling was project manager and principal technical contributor to a value-impact analysis of potential resolutions to a NRC Generic Safety Issue regarding the reliability of HVAC and room cooler systems at commercial nuclear power plants. This multi-year, multi-disciplinary project examined the effects of alternative strategies for improving the reliability of HVAC/room cooler systems whose functions are to maintain ambient temperatures in safety-related areas of nuclear power plants at levels acceptable for equipment operation. Major activities in the project include an assessment of vulnerabilities to HVAC/room cooler failures, assessment of room heatup rates following loss of room cooling, assessment of the effects of elevated room temperatures on the reliability of safety-related equipment, and an assessment of the core damage frequencies, public risks, and costs associated with room cooler failures and the potential resolutions.

Mr. Daling was manager and technical contributor to a multi-million dollar research program sponsored by the U.S. Nuclear Regulatory Commission's Office of Nuclear Regulatory Research (RES). The objective of this program is to develop and implement a methodology to quantify risks, radiation doses, and costs associated with safety issues involving nuclear power plants. This information has been used by RES to rank safety issues for further investigation and possible implementation. Mr. Daling's responsibilities included program management, business development, client support/interface, and technical contributions to the development of quantitative cost and risk impact information.

Mr. Daling was a task leader and technical contributor to a value-impact assessment of proposed revisions to Regulatory Guide 1.78 that provides guidance to NRC licensees on control room habitability evaluations. Mr. Daling was responsible for preparation of quantitative and qualitative evaluations of the extent to which the

proposed revisions would affect current licensees, impacts on licensee costs, and the impacts on public and worker risk. A detailed value-impact assessment document was published and used in NRC rulemaking activities regarding the proposed revisions.

Mr. Daling was Technical Contributor to a project that investigated the engineering and safety implications of bivalve, sediment, and corrosion fouling in nuclear power plant service water systems. This project was sponsored by the Nuclear Regulatory Commission. Mr. Daling was responsible for identifying and evaluating the engineering characteristics of nuclear power plants that make them susceptible to fouling. He was also responsible for identifying events that could either be caused directly by biofouling or could be exacerbated by the presence of biofouling in nuclear power plant raw water systems. Mr. Daling is currently responsible for preparation of a cost/benefit analysis in support of NRC rulemaking decisions (i.e., regulatory analysis) on alternative fouling surveillance and control programs proposed to be implemented at nuclear power plants.

Mr. Daling was a technical contributor to a safety audit and inspection of nuclear waste management facilities in Belgium. The study was sponsored by the Belgian Ministry of Economic Affairs and the Secretary of State of Energy and was performed by staff members from Battelle-Frankfurt FRG as well as Battelle-Pacific Northwest Laboratories. The audit encompassed the waste treatment, transport, and storage facilities of the SCK/CEN Waste, Mol, and Belgoprocess, Dessel, Belgium. The audit included onsite inspections, reviews of safety documentation, and identification and assessment of hazards at these facilities.

Mr. Daling was project manager and principal technical contributor to a life-cycle cost and risk analysis of alternative potential truck and rail/intermodal configurations for transportation of low-level radioactive wastes from DOE generators to the Nevada Test Site disposal areas. The costs and risks associated with continued use of existing highway routes that travel over Hoover Dam and through Las Vegas to the NTS were quantified and compared to the risks of alternative highway routing configurations that avoid Hoover Dam and Las Vegas. The feasibility, costs, and risks associated with two alternative truck/rail intermodal configurations in which LLW shipping containers would be loaded onto trucks at generator sites and shipped to a nearby railhead, transferred from the trucks to railcars, transported by rail to Nevada, and then transferred to trucks for the rest of the trip to the NTS disposal areas were also evaluated.

Mr. Daling was project manager and principal technical contributor to assessments of the risk of transporting selected nuclear weapons components in the Safe-Secure Trailer (SST). A risk-based methodology was used to determine the public health risks associated with these shipments and compare the results with acceptable risk guidelines established by the DOE. Mr. Daling's responsibilities included overall project coordination and integration between the sponsor (Mason and Hanger - Silas Mason Co., Inc., operators of the Pantex Plant), DOE - Albuquerque, Sandia National Laboratories, and Lawrence Livermore National Laboratory, overall preparation of the risk assessment document and comment response documents, coordination and interface with the DOE independent review panels, and preparation of the containment analysis, quality, and operations chapters.

Mr. Daling was a key technical contributor to project funded by the U. S. Department of Energy to develop a comprehensive risk-based cleanup strategy for Hanford that 1) protects the public, workers, and environment from unacceptable risks, and 2) fits within a reduced annual funding profile. Battelle-PNL staff participated on a team that developed this strategy along with participants from Westinghouse Hanford Co. and Bechtel Hanford Inc. The risk-based strategies were developed through a systems analysis approach that analyzed the cleanup mission, identified cleanup objectives (such as risk reduction, land use, and facility mortgage reduction), analyzed the existing baseline strategy in terms of its costs and levels of risk reduction, developed cleanup alternatives and compared those alternatives against the objectives, and derived conclusions and recommendations regarding the current strategy and potential risk-based strategies. This project developed a

framework and set of tools for dealing with changes in anticipated funding levels, regulatory requirements, cleanup standards, and Congressional initiatives. Land-supply curves, cost profiles, risk profiles, mortgage-reduction curves, and minimum operations costs tools were developed for all major Hanford site cleanup activities, including facility deactivation, decontamination, decommissioning, tank waste remediation, groundwater remediation, and environmental restoration activities. Mr. Daling's responsibilities included preparation of worker risk and safety estimates and contributor to assessments of long-term public risks and risks from acute releases (i.e., accidents).

Mr. Daling has managed and contributed technically to several Environmental Impact Statements and Environmental Assessments for the DOE and NRC. His contributions have included management and technical roles in support of transportation impact analyses, human health and safety impact analyses, developing responses to comments, and independent technical reviews of the following environmental documents:

- Medical Isotope Production Reactor Environmental Impact Statement. The purpose of the EIS was to evaluate the environmental impacts of various alternatives for production of Molybdenum-99, a radioactive isotope decays to metastable Technetium-99m, a radioactive isotope that is widely used in medical diagnostic procedures. The EIS prepared as a result of this work received the Award of Excellence in the category of Technical Reports from the Society of Technical Communications.
- Several supplemental analyses related to the Waste Isolation Pilot Plant (WIPP). These includes a proposal to conduct astrophysical and related experiments at the WIPP Site, a proposal to dispose of PCB-contaminated wastes at the WIPP, and a proposal to construct and operate an actinide chemistry and underground repository sciences laboratory at the WIPP Site.
- Independent review of the transportation impact analysis for the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental EIS* and contributed to development of comment responses and preparation of the final transportation impact analysis sections. Mr. Daling was also a key contributor and participant to the Public Hearings conducted to obtain comments on the Draft EIS.
- An analysis of the No-Action Alternative in the Yucca Mountain Repository Environmental Impact Statement. The project supported an evaluation of the human health consequences of long-term storage of commercial spent nuclear fuel and high-level waste in concrete and steel storage systems at surface facilities (as opposed to a deep geologic disposal facility). Mr. Daling's responsibilities included development and application of a computer code to model long-term degradation of concrete and steel barriers postulated to be placed around commercial spent fuel at reactor sites, dissolution of the uranium oxide waste form, and estimation of the flux (mass per unit time) of uranium dioxide released to the environment.
- Analysis of the environmental impacts of transporting high-burnup spent nuclear fuel from commercial light waste reactors to the spent fuel disposal facility at Yucca Mountain, Nevada. The study examined the environmental impacts of transporting spent nuclear fuel with burnups up to 75,000 MWd/MTU. Mr. Daling implemented the RADTRAN computer code to quantify the environmental impacts of routine transport and accidental releases of spent nuclear fuel in transit. The analysis was used by the NRC to support decision-making about allowing utilities to increase fuel burnup.
- Transportation sections of the Comment Response Document for the Yucca Mountain EIS. Mr. Daling was responsible for reviewing and developing responses to hundreds of transportation-related comments on the Draft EIS from the public, regulators, and others. This effort involved a complex coordination of responses from numerous technical staff involved in preparing the EIS as well as the technical team preparing the Comment Response Document.
- Transportation impact analysis in support of the EIS on management of spent nuclear fuel currently in storage at the K basin storage facility, Hanford Site. Mr. Daling was responsible for assessments of the radiological and nonradiological impacts of various spent fuel management alternatives, including

development of input data for transportation impact analysis and highway and rail routing analysis computer codes as well as preparation of the transportation impact appendix and main text sections of the EIS dealing with transportation impacts.

- Assessment of the transportation impacts associated with transportation of irradiated N-Reactor fuels in support of a fuel characterization program being conducted at a PNL facility. Mr. Daling's responsibilities included preparation of input data for a transportation risk assessment computer code (e.g., release fractions, accident probabilities, atmospheric dispersion, etc.), running the computer code, and preparing the documentation for the transportation impact analysis.
- Mr. Daling was task leader and technical contributor to a transportation impact analysis for shipment of Low-Specific-Activity (LSA) nitric acid from the Hanford Site to three Eastern United States ports. Mr. Daling was responsible for assessments of radiological and nonradiological impacts, including development of source term data, release fractions, and accident frequencies as well as atmospheric dispersion and hazardous chemical consequences of potential nitric acid releases en route.
- Environmental Assessment on the transportation of cesium and strontium capsules from their offsite locations to the Hanford Site. Mr. Daling was responsible for preparation of the transportation impact analysis using the RADTRAN 4 computer code. Mr. Daling was also responsible for the interface with the outside organizations (e.g., State of Idaho) who had comments and/or questions on the transportation portions of the EA.
- Environmental Assessment regarding the handling and transportation of radioactive vitrified glass incorporating large quantities of Cs-137 and Sr-90. These vitrified glass canisters were prepared at the Hanford Site and are to be shipped overseas to the Federal Republic of Germany for use in a high-level waste disposal research program. Mr. Daling's responsibilities included development of radiological and nonradiological impacts estimates as well as preparation of the EA.
- Supplements 1 and 2 of the Three Mile Island Programmatic Environmental Impact Statement. For the preparation of Supplement 1, Mr. Daling evaluated the radiological and nonradiological impacts of transporting alternative treated forms of accident-generated water from TMI to various disposal facilities. Supplement 2 addressed treatment, transport, and disposal of various low-level wastes projected to be generated as a result of alternative decontamination and decommissioning strategies.

SELECTED PUBLICATIONS

Daling, P. M. et al. 1993. *Value-Impact Analysis of Generic Issue 143, "Availability of Heating, Ventilation, and Air Conditioning (HVAC) and Chilled Water Systems*. NUREG/CR-6084, PNL-8750. Pacific Northwest Laboratory, Richland, Washington.

Daling, P. M. et al. 1994. "Value Impact Assessment for Resolution of Generic Issue 143 - Availability of HVAC and Chilled Water Systems," in *Proceedings of the 23rd DOE/NRC Nuclear Air Cleaning and Treatment Conference*, Buffalo, New York, July 25-28, 1994. NUREG/CP-0141, CONF-940738. Harvard Air Cleaning Laboratory, Boston, Massachusetts.

Daling, P. M. et al. 1995. "Assessment of Costs and Benefits Associated with Resolution of Generic Issue 143 - Availability of HVAC and Chilled Water Systems," in *Nuclear Technology*, Volume 109, No. 3. American Nuclear Society, La Grange Park, Illinois.

L.B. Sasser and P.M. Daling. 1999. *Recommendations for Revision of Regulatory Guide 1.78*. NUREG/CR-6624, Pacific Northwest Laboratory, Richland, Washington.

Daling, P. M. and W. C. Milstead. 1989. "Application of a Methodology to Determine Priorities of Nuclear Power Plant Safety Issues," in *Nuclear Engineering and Design*. 115 (1989) 273-279. Elsevier Science Publishers, North-Holland, Amsterdam.

Daling, P. M. 1987. "Application of A Methodology to Determine Priorities for Nuclear Power Plant Safety Issues," presented at *Fifteenth Water Reactor Safety Information Meeting*, October 26-30, Gaithersburg, Maryland. PNL-SA-15164.

Andrews, W. B., P. M. Daling, et al. 1983, 1984, 1985, 1987, and 1995. *Guidelines for Nuclear Power Plant Safety Issue Prioritization Information Development*. NUREG/CR-2800 and Supplement Nos. 1, 2, 3, 4, and 5, PNL-4297 and Supplement Nos. 1, 2, 3, 4 and 5. Pacific Northwest Laboratory, Richland, Washington.

Andrews, W. B., P. M. Daling, et al. 1986. *A Ranking of Sabotage/Tampering Avoidance Technology Alternatives*. NUREG/CR-4462, PNL-5690. Pacific Northwest Laboratory, Richland, Washington.

Neitzel, D. A., K. I. Johnson, P. M. Daling, and T. Y. Chang. 1989. "Improving the Reliability of Service-Water Systems at Nuclear Power Plants," in *Transactions of the Seventeenth Water Reactor Safety Information Meeting*. NUREG/CP-0105. U. S. Nuclear Regulatory Commission, Washington D.C.

Neitzel, D. A., K. I. Johnson, and P. M. Daling. 1989. "Improving the Reliability of Service-Water Systems at Nuclear Power Plants," in *Nuclear Plant Journal*. May-June 1989, Vol. 7, No. 3. EQES Inc., Glen Ellyn, Illinois.

Daling, P. M., D. L. Stiles, S. A. Weakley, and K. I. Johnson. 1988. *Regulatory Analysis for Generic Issue 51: Improving the Reliability of Open-Cycle Water Systems*. NUREG/CR-5234. Pacific Northwest Laboratory, Richland, Washington.

Neitzel, D. A., K. I. Johnson, T. L. Page, J. S. Young, and P. M. Daling. 1984. *Bivalve Fouling of Nuclear Power Plant Service-Water Systems. Volume 1: Correlation of Bivalve Biological Characteristics and Raw-Water System Design*. NUREG/CR-4070 Vol 1, PNL-5300 Vol 1. Pacific Northwest Laboratory, Richland, Washington.

Daling, P. M., K. I. Johnson. 1985. *Bivalve Fouling of Nuclear Power Plant Service-Water Systems. Volume 2: Current Status of Surveillance and Control Techniques*. NUREG/CR-4070 Vol 2, PNL-5300 Vol 2. Pacific Northwest Laboratory, Richland, Washington.

Henager, C. H., P. M. Daling, K. I. Johnson. 1985. *Bivalve Fouling of Nuclear Power Plant Service-Water Systems. Factors That May Intensify the Safety Consequences of Biofouling*. NUREG/CR-4070 Vol 3, PNL-5300 Vol 3, Pacific Northwest Laboratory, Richland, Washington.

Daling, P.M., S.B. Ross, and B.M. Biwer, 1999. *Life-Cycle Cost and Risk Analysis of Alternative Configurations for Shipping Low-Level Radioactive Waste to the Nevada Test Site*. DOE/CH/CRE-6-1999. Prepared for the U.S. Department of Energy, Center for Risk Excellence, Chicago Operations Office, Argonne, Illinois.

Daling, P.M., S.B. Ross, and B.M. Biwer, 2000. "Assessment of Modal Options for Transporting Low-Level Radioactive Waste to the Nevada Test Site," presented at *Conference on Radiation Protection and Our National Priorities: Medicine, the Environment, and the Legacy*, September 17-21, Spokane, Washington.

P.R. Siebach, P.M. Daling, S.B. Ross, and B.M. Biwer, 2000. "Life-Cycle Evaluation of Alternative Configurations for Shipping Low-Level Radioactive Waste to the Nevada Test Site," presented at the *Third Dixie Lee Ray Memorial Symposium, Global Carbon Management and Sequestration Technologies, Life-Cycle Analysis*, August 29-31, 2000, Washington D.C.

Daling, P. M. et al. 1994. *Transportation System Risk Assessment for Shipment of W71 Rear Assembly Components in the Safe-Secure Trailer (U)*. Pacific Northwest Laboratory and Mason and Hanger, Silas Mason, Co., Inc. Amarillo, Texas (Secret Restricted Data).

Daling, P. M. et al. 1994. *Transportation System Risk Assessment for Shipment of W56 Subassemblies in the Safe-Secure Trailer (U)*. Pacific Northwest Laboratory and Mason and Hanger, Silas Mason, Co., Inc. Amarillo, Texas (Secret Restricted Data).

Daling, P. M. and M. S. Harris. 1994. *Transportation Impact Analysis for Shipment of Irradiated N-Reactor Fuel and Associated Materials*. PNL-10249. Pacific Northwest Laboratory, Richland, Washington.

U. S. Department of Energy. 1995. *Medical Isotope Production Project: Molybdenum-99 and Related Isotopes - Environmental Impact Statement*, Appendix B: Analysis of Transportation Impacts. DOE/EIS-0249-F. Washington D.C.

Ramsdell, J.V., P.M. Daling, et al. 2001. *Environmental Effects of Extending Fuel Burnup Above 60 Gwd/MTU*. NUREG/CR-6703. Pacific Northwest Laboratory, Richland, Washington.

U. S. Department of Energy. 1994. *Environmental Assessment, Return of Isotope Capsules to the Waste Encapsulation and Storage Facility, Hanford Site, Richland, Washington*. DOE/EA-0942. Washington D.C.

U. S. Department of Energy. 1994. *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Draft Environmental Impact Statement, Volume 1 Appendix A, Hanford Site Spent Nuclear Fuel Management Program*. DOE/EIS-0203-D. Washington D.C.

U. S. Department of Energy. 1996. *Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington*. DOE/EIS-0245D and DOE/EIS-0245F. Richland, Washington.

U. S. Department of Energy. 1995. *Environmental Assessment for Characterization of Stored Defense Production Spent Nuclear Fuel and Associated Materials at the Hanford Site*. DOE/EA-1030. Richland, Washington.

J. R. Green and P. M. Daling. 1994. *Transportation Impact Analysis for the Shipment of Low Specific Activity Nitric Acid*. WHC-SD-TP-RPT-015, Rev. 0. Westinghouse Hanford Corp., Richland, Washington.

Daling, P. M., A. K. Stalker, M. S. Harris, and A. L. Franklin. 1988. *Environmental Assessment: Handling and Transportation of Isotopic Heat Sources*. DOE/EA-0358. Prepared for the U. S. Department of Energy, Richland, Washington.

U.S. Nuclear Regulatory Commission. 1987. Appendix D of *Programmatic Environmental Impact Statement Related to Decontamination and Disposal of Radioactive Wastes Resulting from the March 29, 1979 Accident at Three Mile Island Nuclear Station Unit 2*. NUREG-0683, Supplement 2. Washington D.C.

Daling, P. M., et al. 2002. *Environmental Assessment for the Actinide Chemistry and Repository Science Laboratory*. DOE/EA-1404. U. S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

Daling, P. M., et al. 2001. *Environmental Assessment Conducting Astrophysics and Other Basic Science Experiments at the WIPP Site*. DOE/EA-1304. U. S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

Daling, P. M., et al. 2001. *Supplement Analysis to the WIPP SEIS-II for Disposal of PCB-Commingled TRU Waste at WIPP*. DOE/EIS-0226-S-2. U. S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

Hesser, W. A., P. M. Daling, et al. 1995. *Development of a Risk-Based Approach to Hanford Site Cleanup*. PNL-10651. Pacific Northwest Laboratory, Richland, Washington.

Pelto, P. J., P. M. Daling, et al. 1998. *Analytical Approach for Estimating Releases of Spent Nuclear Fuel and High-Level Waste for the Yucca Mountain Environmental Impact Statement No-Action Alternative*. Battelle Pacific Northwest Division, Richland, Washington.

Hampel, G., Daling, P., Dinsmore, S., Gramatte, W., and Nikodem, H. 1989. *Safety Aspects of an Audit of the Belgian Nuclear Waste Facilities at SCK/CEN-Waste, Mol, and Belgoprocess, Dessel*. BF-V-67.144-1. Battelle- Institute E.V., Frankfort Am Main.

March 1, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

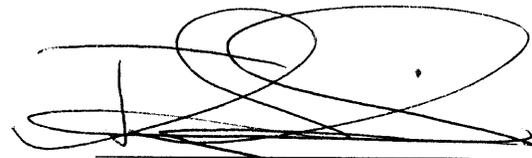
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
DOMINION NUCLEAR NORTH ANNA, LLC) Docket No. 52-008-ESP
)
(Early Site Permit for North Anna ESP Site))

AFFIDAVIT OF JEAN-CLAUDE DEHMEI CONCERNING NRC STAFF RESPONSE
TO THE BOARD'S ENVIRONMENT-RELATED QUESTIONS

I, Jean-Claude Dehmel, do hereby state as follows:

1. I am a Senior Health Physicist in the Nuclear Regulatory Commission's ("NRC") Office of Nuclear Reactor Regulation ("NRR"), Division of Inspection and Regional Support ("DIRS"). A statement of my professional qualifications is attached.
2. I have reviewed those sections of NUREG-1811, the "Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," December 2006, that relate to radiological impacts of routine operation to members of the public and to the environment, as well as the radioactive waste treatment system.
3. I am responsible for a portion of the response to Board Question 35 in Attachment A to the "NRC Staff Legal Brief in Response to the Licensing Board's Environment-Related Questions" for which I am listed as the author.
4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.



Jean-Claude Dehmel

**STATEMENT OF PROFESSIONAL QUALIFICATIONS
OF
JEAN-CLAUDE DEHMEL**

CURRENT POSITION

Senior Health Physicist
Health Physics Branch
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

EDUCATION

M.S., Health Physics, New York University - Environmental Medicine, New York, NY, 1980
B.S., Radiological Health, Manhattan College, Riverdale, NY, 1977

PROFESSIONAL AFFILIATIONS

Health Physics Society
American Nuclear Society
Institute of Electrical and Electronic Engineers

CERTIFICATIONS

Certified Health Physicist - Comprehensive Certification since 1986

INDUSTRY COMMITTEE ACTIVITIES

Health Physics Society, ANSI/HPS N13.53, Control and Release of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM), Chair for the development of the standard
Health Physics Society, ANSI/HPS N13.12, Surface and Volume Radioactivity Standards for Clearance, Working Group member on reaffirmation of standard

QUALIFICATIONS

Mr. Dehmel is experienced in the field of health physics and nuclear licensing, with over 25 years of experience that includes operational radiation protection. This experience, as an employee and consultant, was acquired at various nuclear facilities and project sites, including nuclear power plants (Shoreham, Waterford 3, St. Lucie 2, D.C. Cook 1 & 2, Shearon Harris, James Fitzpatrick, and Philippine NPP-1); a by-product material production facility (Union Carbide/Centichem) with a 5-MW pool reactor and hot-cells; a pharmaceutical research laboratory (Sterling Drug/Sanofi); a fuel conversion facility (Sequoyah Fuels); and various Department of Energy (DOE) national laboratories (Oak Ridge, Paducah, Grand Junction, Los Alamos, Berkeley, Rocky Flats, and the Waste Isolation Pilot Plant); and Department of Defense (DOD) facilities (Lake City Army Ammunition Plant, Lake Ontario Ordnance Works, Aberdeen Proving Grounds, McClellan AFB, and the Mechanicsburg Naval Ships Parts Control Center).

Mr. Dehmel has held the position of radiation safety officer under three licenses: (a) NRC (No. 37-28076-01) and Pennsylvania Bureau of Radiation Protection (No. PA-531) for a pharmaceutical research laboratory, located in Great Valley, PA (Eastman Pharmaceuticals, Sterling Drug, and now Sanofi); (b) S. Cohen & Associates, Inc. Montgomery, AL, for D&D License No. 1270 issued by the Alabama Office of Radiation Control, and (c) with the Department of the U.S. Army under permit No. P-19-0027-APG (Docket No. 0027) issued by the Aberdeen Proving Ground facility, Aberdeen, MD.

Mr. Dehmel joined the NRC in 2000. Prior to joining the NRC, Mr. Dehmel was employed by two consulting companies, a nuclear utility, an architect and engineering firm, and a radiochemical production facility.

NRC Experience

At the NRC since June 2000, Mr. Dehmel is currently responsible for the review of early site permit applications, a design certification, and topical reports. Mr. Dehmel is currently supporting the reviews of the North Anna and Vogtle ESP applications, the review of the GE ESBWR design certification application, and the review of a topical report for the AP1000 reactor on the selection of absorbent media in treating radioactive effluents. These reviews focus on information documenting compliance with radioactive effluents and doses to members of the public under normal operations and anticipated operational occurrences. The technical reviews are conducted against NRC requirements under 10 CFR Part 50.34a, Part 50.36a, Appendix I to Part 50, 10 CFR Parts 20.1301 and 20.1302, and Appendix B (Table 2) to Part 20. The reviews rely on guidance of the Standard Review Plan (NUREG-0800), Sections 11.2 to 11.5, and several Division 1 Regulatory Guides. The regulatory guides present acceptable methods for estimating liquid and gaseous effluent source terms, dispersion of radioactivity in the environment, and methods for calculating doses to members of the public. Mr. Dehmel is also working on the revision of NRC guidance addressing the above topics.

Regarding operating reactors, Mr. Dehmel evaluated the methodology used by Vermont Yankee to assess doses associated with N-16 radiation exposures at the site boundary. The licensee incorporated three methods in demonstrating compliance, one involving ambient radiation measurements to identify locations with the highest radiation levels along the site boundary, one correlating plant power levels with radiation survey results at the site boundary, and one correlating main steam line radiation monitor readings with radiation survey results at the site boundary. The review assessed the technical merits of the methods, basis of assumptions, validity of the results, and how results are being used in demonstrating compliance with NRC regulations and EPA standards of 40 CFR Part 190. For the Ginna Plant, Mr. Dehmel evaluated an application requesting a partial site release for a portion of the site not used by plant operations.

Regarding decommissioning, Mr. Dehmel was responsible for the review and evaluations of license termination plans and decommissioning plans submitted by licensees. Mr. Dehmel was responsible for six sites, including the Trojan, Maine Yankee, and the Haddam Neck power reactors, and the Mallinckrodt, Kerr-McGee, and Kaiser Aluminum facilities, as Part 40 material sites. The process involves identifying technical deficiencies with respect to the requirements of Appendix E to 10 CFR Part 20, and MARSSIM and SDMP criteria. Other supporting functions included conducting site inspections and planning and participating in the implementation of NRC site confirmatory surveys. Mr. Dehmel participated in other NRC projects, including risk assessment analyses supporting the evaluation of proposed survey methods against site release criteria; providing comments on studies and reports addressing the use of advance instrumentation and analytical methods to determine residual radioactivity levels on solid materials and at sites; providing comments to the NRC Clearance Rulemaking Working Group; providing information in support of the preparation of a RIS on MARSSIM lessons-learned, and presentations before the MARSSIM working group on specific topics.

Private Sector Experience

September 1988 to June 2000 - S. Cohen & Associates, Inc., McLean, VA

Under an NRC-sponsored contract, Mr. Dehmel was assigned as the Project Manager involving the characterization of Class A low-level radioactive waste (NUREG/CR-6147) by category of waste generators, namely academic, government, industrial, medical, and nuclear power plants. The study is based on 1986 to 1990 information contained in the Manifest Information Management System, and supplemented by other studies sponsored by the NRC, DOE, and Low-level Waste Compacts and unaffiliated States. A database program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of wastes listed in shipping manifests. The results of the analyses are summarized in tables, histograms, and cumulative radionuclide

concentration distributions by waste streams, generators, and regions, with data summaries at the container and shipment levels.

Lead investigator for the preparation of the waste characterization and source term development for the EPA's Low-Level Waste Background Information Document and Regulatory Impact Analysis Report for the low-activity mixed waste rule. The work involved updating a prior NRC characterization of mixed waste volumes, generation rates, properties, and radionuclide concentrations (NUREG/CR-5938, National Profile on Commercially Generated Low-Level Radioactive Mixed Waste, Dec. 1992). Agreement State Agencies and industry trade groups were contacted to obtain post-1992 information. The data were reviewed and compared with prior survey compilations for assessing changes in waste generations rates, volumes held in storage, use of new treatment options, and radionuclide distributions and concentrations. The discussion presented a comparison of the regulatory requirements and engineering design differences between low-level waste disposal facilities and RCRA Subtitle C landfills.

Participated in a Chernobyl scientific mission to the Republic of Belarus organized by the World Bank and EPA. The purpose of the mission was to evaluate the technical and cost-effectiveness of the Chernobyl remediation program and collect soil samples for analysis at the U.S. EPA-NAREL Laboratory. Technical discussions addressed the scope of protective measures being implemented to protect the food supply, uses of different blends of fertilizers to retard radionuclide uptake in crops, use of plowing methods to relocate radionuclides in soils beyond the root zone of local crops, and the scope of radioanalytical programs in determining Cs-137, Sr-90, and Pu-239/240 concentrations in meat, dairy products, food crops, and soils.

July 1986 to September 1988 - Roy F. Weston, West Chester, PA

Mr. Dehmel prepared the radiological sections of work plans and health and safety plans to characterize Pu-239 contamination (Pu-239) at the BOMARC Nike missile silo site, located at McGuire AFB, NJ. The contamination was due to the accidental combustion of the Pu warhead. The radiological plans were used to establish personnel and environmental radiation protection requirements for the project. The project, although implemented on DOD facility, was implemented and managed under the NRC requirements of 10 CFR Parts 19 and 20.

Prepared a preliminary decontamination and decommissioning plan to survey the Quehanna Research Facility, located near State College, PA. The former R&D facility was contaminated with Pu-239, Am-241, and Sr-90, and other long-lived mixed fission products. The plan also provided a regulatory analyses of current NRC and PADER requirements and the facility's license conditions. A chronology of past site activities and former licensees was developed for the purpose of identifying radionuclides and residual activity levels by types of AEC/NRC licenses.

Conducted an independent radiological characterization of alpha contamination (Po-210) at a photo-processing laboratory, located in Cleveland, TN. The contamination was due to defective static electricity eliminators that were used as air guns which produced hot particles as microspheres. The surveys were performed for QA/QC purposes at the request of the Division of Radiological Health, State of Tennessee, and a factory recall initiated by 3M. The characterization involved conducting direct alpha scans and smears of building and equipment.

Member of a technical team responsible for upgrading DOE's Rocky Flats capability in monitoring Pu/Am in machining oils and sludge. A gamma spectroscopy system (using a SiLi detector) was procured, set-up and calibrated, based on specifications stipulated by the Rocky Flats Plant. The system was set-up at the site using a standards and sample container provided by plant personnel and a training session was conducted for the staff responsible for its operation. An operation and calibration package was submitted along with the software used to reduce the results to meaningful radiological units.

July 1985 to July 1986 - Long Island Lighting Company, Shoreham NPS, Wading River, NY

As a Section Supervisor, Mr. Dehmel's responsibilities included ALARA support during low power testing, assessing plant radiological effluent emissions, and supporting emergency response functions. In this latter role, Mr.

Dehmel was assigned to the EOF to run computer models to define radioactive source terms, release rates, and plume location predictions under different accident scenarios. Participated in numerous training exercises and participated in the only full scale exercise implemented at Shoreham.

June 1979 to July 1985 - Ebasco Services/Envirosphere Company (a subsidiary), New York, NY

Mr. Dehmel prepared the radiological portions of PSAR and FSAR for nuclear plants under construction and prepared radiological effluent technical specifications and offsite dose calculation manuals for six power reactors (Waterford 3, St. Lucie 2, D.C. Cook 1 & 2, Shearon Harris, James A. Fitzpatrick, and Philippine NPP-1). Conducted evaluations of nuclear power plant system modifications in response to changes in technical specifications, applicability reviews of NRC I&E Bulletins, FSAR updates, Part 50.59 safety analyses, and Part 21 reportability reviews. Report preparations have included writing sections of semi-annual radiological effluent reports and others have included providing technical assistance to nuclear power plants for operational health physics and nuclear licensing support. Assisted in the development of a calibration plan for radiation monitoring systems; development of operational and surveillance requirements for radiation monitoring systems; and preparation of implementing procedures for radiological effluent technical specifications and offsite dose calculation manuals. Conducted a quality assurance audit of the radiological environmental monitoring program of Florida Power Corp's Crystal River Unit 3.

Completed a two-month work assignment under the auspices of the IAEA to the Philippine's first nuclear power plant (PNPP Unit 1). The IAEA mission involved providing technical assistance in health physics, training, and radiation monitoring. The results were published in: Environmental Radioactivity Series: The Philippines - Review of Laboratory Procedures, IAEA-TA-2324, June 6, 1985.

September 1973 to June 1979 - Union Carbide Corporation, Tuxedo, NY

Mr. Dehmel was responsible for routine health physics support during the operation of a 5-MW research pool reactor and a radio-pharmaceutical production facility (formerly Union Carbide Corporation and later decommissioned by Cintichem). The responsibilities included the supervision of three health physics technicians and serving as the technical interface with the staff of the radiochemical laboratory and reactor operations group in coordinating radiological coverage for routine operations and scheduled maintenance tasks. The reactor was used to irradiate highly enriched uranium targets (95% U-235 enrichment) to produce primarily Mo-99, Sr 90, I-131, and Xe-133. Other production activities included the manufacturing of Mo-99/Tc-99m generators, P-32, and Cr-51.

SELECTED PRESENTATIONS AND PROCEEDINGS

Omitted here.

March 1, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
DOMINION NUCLEAR NORTH ANNA, LLC)
)
(Early Site Permit for North Anna ESP Site))

Docket No. 52-008-ESP

AFFIDAVIT OF EVA ECKERT HICKEY CONCERNING THE NRC STAFF
RESPONSE TO THE BOARD'S ENVIRONMENT-RELATED QUESTIONS

I, Eva Eckert Hickey, do hereby state as follows:

1. I am employed as a Staff Scientist with the Radiological Sciences and Engineering Group at the Pacific Northwest National Laboratory, managed by Battelle Memorial Institute's Pacific Northwest Division. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.
2. As part of the NRC staff's environmental review of the North Anna ESP application, documented in NUREG-1811, the "Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," December 2006, I assisted the NRC staff in its analysis of the aspects of the applicant's Environmental Report that concerned decommissioning.
3. I am responsible for those responses to Board questions (or portions of questions) in Attachment A to the "NRC Staff Legal Brief in Response to the Licensing Board's Environment-Related Questions" for which I am listed as the author.

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.



Eva Eckert Hickey

EVA ECKERT HICKEY

Staff Scientist, Environmental Health Sciences
Environmental Technology Division

Education

M.S.	Health Physics, Georgia Institute of Technology	1980
B.S.	Biology, with an option in Health Physics, Virginia Polytechnic Institute and State University	1978

Experience

Ms. Hickey has worked at Battelle for twenty five years as a project manager and technical group manager. Her areas of health physics expertise include emergency preparedness for nuclear and hazardous material facilities, environmental impact evaluation, decontamination and decommissioning, operational health physics, air monitoring instrumentation and environmental monitoring.

Emergency Preparedness/Management. Ms. Hickey has worked in the area of emergency preparedness since 1979. She was a member of National Council on Radiation Protection and Measurements Scientific Committee 46-14, "Radiation Protection Issues Related to Terrorist Activities that Result in the Dispersal of Radioactive Material", and co-authored the NCRP report, which was published in late 2001. Currently she is supporting a major project for the Department of Homeland Security, where her primary focus is assessing the status of comprehensive emergency preparedness for the Seattle Washington region. She is also assisting King County in enhancing its emergency response plan to respond to an event resulting in radiological materials in the County sewer system.

Ms. Hickey has been involved in the U.S. Nuclear Regulatory Commission and U. S Department of Energy Emergency Management programs, has observed and assessed over 70 NRC/FEMA evaluated exercises at 50 sites in the U.S., and has conducted in-depth emergency preparedness appraisals at many sites. She was involved in the development of the NRC guidance for post-Three Mile Island requirements (NUREG-0654, NUREG-0696, NUREG-0814, NUREG-0737) and was involved in the development of the NRC's comprehensive emergency preparedness appraisal program and subsequent inspection programs. These programs not only involved on-site emergency response, but also in-depth review of local emergency planning and coordination.

While at Battelle, Ms. Hickey served as the Technical Leader for NRC's multi-million dollar Emergency Preparedness program, which had over 20 staff and a like number of contractors. She managed a variety of projects that supported the overall program. Her primary areas of expertise are in emergency dose assessment, environmental monitoring, emergency instrumentation, in-plant surveys, contamination and exposure control and protective actions. Ms. Hickey has performed similar activities for DOE in emergency management guidance development, exercise observation and program evaluation.

Ms. Hickey has been involved in the development and conduct of many training courses and workshops, both for NRC and DOE, in the areas of emergency exercise observation and evaluation, scenario development, exercise conduct, emergency plan reviews and overall emergency preparedness and management. She has also been involved in the development and conduct of exercises, for both NRC and DOE, for fixed facilities and for hazardous material transportation.

Ms. Hickey currently manages an emergency preparedness project for DOE. This project provides technical support in development of regulatory guidance, emergency program enhancement and evaluation, exercise observation, and scenario development for exercises for all types of hazardous material facilities.

Environmental. Ms. Hickey has supported NRC in the preparation of numerous environmental impact statements, including Supplemental Environmental Impact Statements for the relicensing of commercial nuclear reactors as well as environmental impact statements for early site permits for new nuclear power reactors. These reviews include site audits and discussions with state, local and federal representatives associated with the action. She provided technical support to the NRC on updating and revising a standard review plan for the review of environmental protection issues related to nuclear power plant licensing and is currently the task lead for the Environmental review of one of the first three early site permit applications.

Instrumentation and Air Sampling. Ms. Hickey managed a joint NRC and DOE project that developed the ANSI standards for instrument performance and testing. Ms. Hickey was the manager and lead author for an NRC project that developed NUREG-1400, *Air Sampling in the Workplace*, which is a guide for operational health physicists for developing or improving air sampling programs at NRC licensed facilities to support the implementation of the revised 10 CFR Part 20 requirements. In addition, Ms. Hickey provided technical assistance to NRC licensed fuel fabrication facilities in adjusting Derived Air Concentrations to meet the requirements in 10 CFR 20. She has been involved in performing qualitative air flow studies (i.e., smoke testing) at selected Hanford facilities as a means of evaluating the adequacy of air sampler and monitor locations.

Program Evaluation and Assessments. Since joining Battelle, Ms. Hickey has managed and been involved in numerous projects related to the development and conduct of appraisals, program assessments and inspections. She was project manager and technical group leader supporting a major NRC project that developed and conducted intensive appraisals and inspections in support of emergency preparedness following the accident at Three Mile Island. She has conducted more than 70 appraisals, audits and inspections at NRC licensed and DOE facilities. In many cases she was the team leader for a PNL team including health physicists, nuclear engineers, human factors experts, computer scientists and safety and security experts. In addition to her NRC emergency preparedness support, she was a major contributor to a project for DOE HQ that

developed assessment procedures for evaluating the oversight of DOE in the areas of health physics, industrial hygiene and emergency management.

Decommissioning. Ms. Hickey was the task leader for the development of the revision to NUREG-0586, *Generic Environmental Impact Statement of Decommissioning of Nuclear Facilities*. Ms. Hickey also assisted in the development of regulatory guidance for the NRC to provide to licensees of nuclear power plants that are planning to or have permanently ceased power operations. Ms. Hickey provided technical support to the NRC during its review of the Trojan Nuclear Plant's Decommissioning Plan.

Operational Health Physics. Ms. Hickey has provided technical support to DOE and NRC in health physics and industrial hygiene. Ms. Hickey has been involved in the preparation of guidance to support the DOE Orders with respect to 10 CFR 835 and the Radiological Control Manual (RCM), and NRC guidance to support 10 CFR 20 requirements. She has conducted radiological audits and appraisals at various Hanford facilities. She has contributed to the preparation of radiological sections of Safety Analysis Reports (SARs). Ms. Hickey was the project manager and primary contributor to the draft Pantex Radiological Control Manual and has been involved in projects at Pantex related to the implementation of the RCM and 10 CFR 835. Ms. Hickey has been a technical contributor to projects, for both NRC and DOE, related to residual radioactivity and contamination surveys at nuclear power plants and other nuclear facilities.

From February through August 1985, Ms. Hickey was a Senior Radiological Engineer for Hydro Nuclear Services, Inc. (HNS). She was project manager for a six person team providing technical assistance to Georgia Power Company (GPC) in the areas of health physics, chemistry and emergency preparedness. In addition, Ms. Hickey was project manager for the development and conduct of the Hatch Nuclear Plant 1985 emergency preparedness exercise.

In 1979, Ms. Hickey (Eckert) was an environmental engineer (co-op) for the Nuclear Regulatory Commission, Region II and provided support to NRC inspectors during nuclear reactor inspections and during the Three Mile Island accident investigation.

Professional Affiliations

National Council on Radiation Protection and Measurements Scientific Committee 46-14, "Radiation Protection Issues Related to Terrorist Activities that Result in the Dispersal of Radioactive Material"

Member of the Board of Directors for the Health Physics Society 2004-2007

Member of the Health Physics Finance Committee 2004-2007

President of the Columbia Chapter Health Physics Society 1994-95.

Member of the national Health Physics Society since 1981.

HPSSC Working Group "Methods for evaluating radiation protection requirements for handling radioactive material."

HPSSC Working Group "Air Sampling"

Member and Chair of the Health Physics Society Summer School Committee 1986 - 1989 and member 1992 - 1999.

Member of the Columbia Chapter Health Physics Society (CCHPS) since 1980. President-elect for 1993-94.

Member of the CCHPS Public Information and Publicity Committee 1983 - 1984.

CCHPS Assistant Newsletter Editor 1984 - 1986.

CCHPS Newsletter Editor 1987 - 1989.

CCHPS Member of the Program Committee 1990 - 1995

Publications and Presentations

E.E. Hickey and JW Poston Sr. 2002, "An Overview of NCRP Report No. 138 on Terrorist Activities". Presented at the 8th Topical Meeting on Emergency Preparedness and Response, Washington DC, November 2002.

National Council on Radiation Protection and Measurements. 2001. *Management of Terrorist Events Involving Radioactive Material*. NCRP Report No. 138. National Council on Radiation Protection and Measurements, Bethesda, Maryland.

E.E. Hickey. 1999, "The Care and Feeding of Your Emergency Program: Enhancing Effectiveness" Presented at the 7th Topical Meeting on Emergency Preparedness and Response, Santa Fe New Mexico, September 1999.

E.E. Hickey, R Harty, L.H. Thonus, M.T. Masnik, "A Look at the Postulated Accidents for Permanently Shutdown Reactors" Presented at the 7th Topical Meeting on Emergency Preparedness and Response, Santa Fe New Mexico, September 1999.

T.A. Kevern, E.E. Hickey, "Emergency Event Classification with Imperfect Information" Presented at the 7th Topical Meeting on Emergency Preparedness and Response, Santa Fe New Mexico, September 1999.

Strom, D.J., R. Harty, E.E. Hickey, R.L. Kathren, J.B. Martin, and M.S. Peffers. 1998. *Collective Dose as a Performance Measure for Occupational Radiation Protection Programs: Issues and Recommendations*. PNL-11934. Pacific Northwest National Laboratory. Richland, Washington.

G.J. Vargo, J.S. Durham, E.E. Hickey, P.S. Stansbury, G.R. Cicotte, "Review of ALARA Plan for

Activities at the 105K-East Fuel Storage Basin," PNL-9826 Rev.2, Septemeber 1994.

E. E. Hickey, G. A. Stoetzel and S. A. McGuire, "Air Sampling In The Workplace - A Document To Support the Revised Regulatory Guide 8.25," PNL-SA-19011A presented at the Annual Health Physics Society, July 1991.

E. E. Hickey, G. A. Stoetzel, D. J. Strom, G. R. Cicotte, C. M. Wiblin, S. A. McGuire, "Air Sampling in the Workplace," NUREG-1400, U.S. Nuclear Regulatory Commission, September 1993.

Eva Eckert Hickey, "Optimization of Emergency Preparedness Planning", PNL -7380. Prepared for the Department of Energy

Eva Eckert Hickey, "Optimization of Emergency Preparedness Planning", PNL-SA-17740A, presented at the Annual Health Physics Society meeting in June 1990.

J. G. Stephen, L. G. Faust, J. M. Selby, E. E. Hickey, "Population and Worker Doses at DOE Sites and Commercial Generating Stations", PNL-SA-16698S, presented at the American Nuclear Society meeting in June 1989.

W. E. Kennedy, and E. E. Hickey, "Estimated Collective Exposures from U.S. Department of Energy Operations", PNL-SA-16617, presented at the American Nuclear Society meeting in June 1989.

E. E. Hickey, and W. E. Kennedy, "A Review of Environmental Radiological Data from U.S. DOE Nuclear Sites", PNL-SA-16516A, presented at the Health Physics Society meeting in June 1989.

J. M. Selby, E. E. Hickey, K. L. Swinth, "Radiation Protection Instrumentation - A Comparison of U. S. International Standards", PNL-SA-16265, presented at the Health Physics Society Midyear Topical Meeting on Instrumentation in December 1988.

J. M. Selby, E. E. Hickey, K. L. Swinth, "Comparison of U. S. and International Standard for Radiation Protection Instrumentation", PNL-SA-14747, presented at the 7th International Radiological Protection Agency Congress.

E. E. Hickey, V. L. Magnus, "Reducing Exposure to ALARA When Refueling DOE's N Reactor", PNL-SA-13644A, presented at the Annual meeting of the Health Physics Society, June 1986.

J. L. Kenoyer, E. E. Hickey, B. J. Greenspan, K. L. Swinth, "Performance Evaluation of Radioactive Aerosol Monitors Used in the Workplace", given at 1987 AIHA Meeting in Montreal, May 1988.

E. E. Hickey, A. E. Desrosiers, T. J. McKenna, "The Relationship Between Emergency Action Levels and Protective Action Decision Making", PNL-SA-11066, presented an the Annual

Health Physics Society Meeting in June 1983.

M. P. Moeller, G. F. Martin, J. D. Jamison, and E. E. Hickey, "A New Method for Presenting Offsite Radiological Monitoring Team Data at Annual Emergency Preparedness Exercises", presented at the American Nuclear Society Topical Meeting in September 1986.

G. F. Martin, E. E. Hickey, G. A. Stoetzel, E. F. Bates, "The Emergency Preparedness Evaluation Program for Research and Test Reactors", PNL-SA-11969, presented at the Annual American Nuclear Society Meeting in June 1984.

G. F. Martin, E. E. Hickey, M. P. Moeller, F. Kantor, "Radiological Data For Scenarios Used During Annual Exercises At Nuclear Generating Facilities", PNL-SA-12906, presented at the Annual Health Physics Society Meeting in July 1985.

G. F. Martin, E. E. Hickey, M. P. Moeller, D. H. Schultz, G. W. Bethke, "Report to the NRC on Guidance for Preparing Scenarios for Emergency Preparedness Exercises at Nuclear Generating Stations", PNL-6931, NUREG CR-3365.

E. E. Hickey, G. A. Stoetzel, J. B. Martin, F. G. Pagano, "Emergency Exercises: Commonly Observed Problems", given at the American Nuclear Society Winter Meeting in November 1983.

E. E. Hickey, J. R. Lewis, M. Lindell, "Criteria for Evaluation of emergency Response Facilities", PNL-3929, NUREG 0814 (draft for comment).

C. D. Corbit, E. E. Hickey, J. G. Myers, "Production Assurance Program Radiological Engineering Studies Status Report", UNI-3615.

E. E. Hickey, R. O. Zimmerman, and G. V. DeLisle, "A Passive Automated Personnel Accountability System for Reactor Emergency Preparedness", PNL-SA-15527A, presented at the Annual Meeting of the Health Physics Society, July 1988 and presented at the ANS Topical Meeting in September 1988.

Significant Contributions to Government Agency Publications for which the Preparing Agency is Author

U.S. Nuclear Regulatory Commission. 2002. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 10 NUREG-1437 Regarding St. Lucie Nuclear Power Plant Units 1 and 2*. NUREG-1437 Supplement 10. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 2002. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 8 NUREG-1437 Regarding North Anna Power Station Units 1 and 2*. NUREG-1437 Supplement 8. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 2002. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 7 NUREG-1437 Regarding Surry Power Station Units 1 and 2*. NUREG-1437 Supplement 7. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 2002. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors*. NUREG-0586, Supplement 1. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 2002. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 5 NUREG-1437 Regarding Turkey Point Nuclear Plant Units 3 and 4*. NUREG-1437 Supplement 5. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 2001. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 3 NUREG-1437 Regarding Arkansas Nuclear One, Unit 1*. NUREG-1437 Supplement 3. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 2 NUREG-1437 Regarding Oconee Nuclear Station*. NUREG-1437 Supplement 2. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission. 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 1 NUREG-1437 Regarding Calvert Cliffs Nuclear Power Plant*. NUREG-1437 Supplement 1. U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Department of Energy. 1997. *Emergency Management Guide, Program Elements Volume IV*. DOE G 151.1-1. U.S. Department of Energy, Washington, D.C.

March 1, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
DOMINION NUCLEAR NORTH ANNA, LLC) Docket No. 52-008-ESP
)
(Early Site Permit for North Anna ESP Site))

AFFIDAVIT OF ANDREW J. KUGLER CONCERNING NRC STAFF RESPONSE
TO THE BOARD'S ENVIRONMENT-RELATED QUESTIONS

I, Andrew J. Kugler, do hereby state as follows:

1. I am a Senior Environmental Project Manager in the Nuclear Regulatory Commission's ("NRC") Office of New Reactors ("NRO"), Division of Site and Environmental Reviews ("DSER"). I served as a past NRC Project Manager for the environmental review of the Dominion Nuclear North Anna, LLC application for an early site permit ("ESP") at the North Anna ESP site near Mineral, Virginia. A statement of my professional qualifications is attached.
2. As project manager, I was responsible for overseeing the preparation of draft NUREG-1811, documented in NUREG-1811, the "Draft Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," November 2004. I subsequently served as the branch chief in charge of oversight of the "Draft Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site (NUREG-1811 Supplement 1)," July 2006, and have served as a contributor and back-up project manager in connection with the "Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site," December 2006 ("FEIS").
3. I am responsible for those responses to Board questions (or portions of questions) in Attachment A to the "NRC Staff Legal Brief in Response to the Licensing Board's Environment-Related Questions" for which I am listed as the author.

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.



Andrew J. Kugler

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF ANDREW J. KUGLER

Current Position

Senior Environmental Project Manager
Division of Siting and Environmental Review
Office of New Reactors
U.S. Nuclear Regulatory Commission

Education

M.S., Technical Management, Johns Hopkins University, Baltimore, MD, 1998
B.S., Mechanical Engineering, Cooper Union, New York, NY, 1978

Qualifications

Mr. Kugler joined the Nuclear Regulatory Commission (NRC) in 1990 as a reactor engineer in the Division of Operating Reactor Safety in the Office of Nuclear Reactor Regulation (NRR). He prepared and issued generic communications (e.g., generic letters, bulletins) to industry regarding safety issues that affected many or all reactors. He also participated as a member of some team inspections (e.g., an augmented inspection team at the La Salle site).

In 1995 Mr. Kugler accepted a position in the Division of Reactor Projects. His first assignment was the coordination of all NRR activities related to implementing dry cask storage at nuclear power plants. After a year, he became the project manager for the Fermi 2 plant, managing all licensing activities for that plant.

In 2000 Mr. Kugler accepted a promotion to Senior Environmental Project Manager in the Division of Regulatory Improvement Programs. He managed the environmental reviews for the renewal of operating licenses for the Hatch, Surry, and North Anna sites. He was also involved in staff activities with industry to resolve issues related to the environmental reviews for the first group of early site permit (ESP) applications. He then became the project manager for the first of the ESP applications, for the North Anna ESP site. In 2004 Mr. Kugler became the chief of the Environmental Branch, managing the staff performing all of the environmental reviews of both license renewal and ESP applications, as well as early preparations for combined license applications. In 2005 he returned to duties as a Senior Environmental Project Manager. His primary duties at this time involve managing an update to the Environmental Standard Review Plan (ESRP, NUREG-1555) and the environmental portion of rulemakings for new reactor reviews.

Before joining the NRC, Mr. Kugler was a Start-up Testing Shift Test Director, licensed Senior Reactor Operator, and System Engineering supervisor at the River Bend Station (1983 - 1990). Prior to that, he was a commissioned officer in the U.S. Navy, serving on a nuclear submarine in the Engineering Department.

Awards

Mr. Kugler has received numerous awards at the Agency. In 1998 he was the NRC nominee for Federal Engineer of the Year.