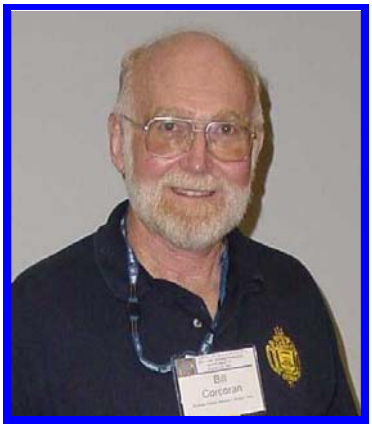
William R. Corcoran, Ph.D., P.E.
Nuclear Safety Review Concepts Corporation
21 Broadleaf Circle, Windsor, CT 06095-1634
Tel: 860-285-8779
e-mail: <firebird.one@alum.MIT.edu>



DUNS: 868752783 Federal EIN: 06-1366520

MISSION:

Saving lives, pain, assets, and careers through thoughtful inquiry.

MOTTO:

If you want safety, peace, or justice, then work for competency, integrity, and transparency.

CONSULTING FOCUS: *High Hazard Industry Performance Analysis and Organizational Learning.*
Mentors and participates in event investigations (root cause analysis). Conducts just-in-time training for event investigation teams. Assesses and trains in the areas of self-assessment, root cause analysis of adverse events, human performance improvement, organizational learning, assurance of quality, and management oversight. Serves on independent advisory teams. Trains government inspectors.

ROOT CAUSE ANALYSIS INVESTIGATION EXPERIENCE: *Serving as mentor, trainer, chair, and senior advisor.*
Construction (generation, transmission<underground and aerial>), nuclear transportation, spent fuel pool operations, nuclear fuel failures, repeated and grouped operational events, uranium conversion process release, uranium enrichment process fire, fossil plant cable fire, fossil plant safety and environmental incidents, oil spills, radiographic safety compromise, natural gas fire, plutonium uptakes, unmonitored radiation exposures, radiation exposure of diver, severe electrical service interruption, reactor core mis-loading, large magnitude foreign material intrusion, diesel sequencer design error, degraded diesel performance, degraded service water performance, unintended cross-connections, reactor protection system design, licensed operator training failures, training common cause analysis, operational common cause analysis, project management issues, equipment mix-ups, switchyard performance, organizational effectiveness issues, industrial safety near miss, cogeneration reliability, rail transportation, regulatory issues, project breakdowns, quality assurance non-compliances, criticality safety infractions, plant component status control, generator hydrogen fire, generator hydrogen excess usage, repeat events, and corrective action program failures, among other significant issues.

QUALITY EXPERIENCE: *Member of Offsite Safety Review Committees and as member or chair of the subcommittees that focused on quality. Special advisor to heads of quality assessment organizations. Multiple quality related investigations. Trainer of quality assessment personnel. Member of Process Safety Advisory Team and External Advisory Board.*

CLIENTS:

American Electric Power Company (D. C. Cook), Areva (Framatome Federal Group), Arizona Public Service Company (Palo Verde), Atomic Energy of Canada, Limited (Chalk River Laboratory), Bechtel National, Inc. (Hanford Waste Treatment Plant), Boston Edison Company (Pilgrim Nuclear Plant), British Petroleum (North America) (through Accenture), Constellation Energy (Nuclear Energy Division, Gas Distribution Division, and Electrical T&D Division), Carolina Power & Light Company (H. B. Robinson), BNFL (British Nuclear Fuels Limited), Inc., Centerior Energy (Davis-Besse), Commonwealth Edison (all nuclear sites), Consumers Energy Company (Palisades, Big Rock Point), Dominion Energy (Kewaunee, Millstone), Entergy Nuclear Operations (River Bend Station), Florida Power Corporation (Fossil Energy), Florida Power & Light (St. Lucie, Turkey Point), General Electric (Nuclear Energy), Houston Lighting & Power (South Texas Project), Honeywell (Specialty Chemicals), HPRCT (The organization for human performance, root cause, and trending), InfraSource (a national infrastructure engineering, construction, and service group), National Energy & Gas Transmission (four fossil stations), Maine Yankee, Massachusetts Institute of Technology (Sloan School of Management), Nebraska Public Power District (Cooper), Northeast Utilities (Connecticut Yankee, Seabrook, Millstone I, II, & III), Northern States Power Company (Monticello), Pacific Gas & Electric Company (Diablo Canyon), PGE National Energy Group(various stations), Pennsylvania Power & Light (Susquehanna), PECO Energy Co. (HQ Information Technology), PECO Nuclear Company (Limerick and Peach Bottom), Douglas G. Peterson & Assoc. (insurance loss investigation), South Carolina Electric and Gas (V. C. Summer), Public Service Electric & Gas (Salem, Hope Creek), Shaw Power Group, Siemens Power Corporation (Nuclear Fuels and Energy Field Services), Structural Integrity Associates, Inc., Tennessee Valley Authority (Watts Bar), Texas Utilities Electric (Comanche Peak), the U. S. Nuclear Regulatory Commission (inspection and training), the U. S. Department of Energy (through contractors at Savannah River, Rocky Flats, Hanford, Idaho National Laboratory, Oak Ridge National Laboratory, Waste Isolation Pilot Plant, Transuranic Waste Processing Center, and Yucca Mountain Project), the U.S. National Nuclear Security Agency (through BWXT Pantex), the U. S. Defense Nuclear Facilities Safety Board, and Wolf Creek Nuclear Operating Corporation.

EDUCATION and REGISTRATION:

Massachusetts Institute of Technology, Ph.D. Nuclear Engineering
Rensselaer Polytechnic Institute, M.S. Management
United States Naval Academy, B.S. with distinction
Registered Professional Engineer (P.E.), Nuclear

PROFESSIONAL EXPERIENCE:

1993 - Present: Nuclear Safety Review Concepts Corporation, President.

Consults, trains, and mentors in the areas of safety, quality, event investigation, organizational learning, engineering, and self-assessment. Developed The Four Factor Accident Consequence Model. Publishes *The Firebird Forum*, a newsletter on organizational learning from adverse experience. Authored *The Phoenix Handbook* (An Event Evaluation Manual for Finding Profit Improvement in Adverse Events). Service on offsite safety review committees and sub-committees. Moderates internet e-groups on root cause analysis practice and on lessons to be learned from certain specific adverse events.

1987 - 1993: TENERA, L. P., Senior Vice President, Quality.

Chaired and served on offsite safety review committees and sub-committees. Consulted and trained in the areas of safety, quality, event investigation, and self-assessment.

1970 - 1987: Combustion Engineering, Inc., Director of: Advanced Light Water Reactor, Nuclear Projects, Nuclear Plant Engineering, Nuclear Systems Engineering, and Nuclear Safety. Manager of Licensing. Supervisor of Reactor Physics. Originator of Critical Safety Function Approach to Emergency Operations and The Four Levels Of Defense Of Quality. Worked in nuclear power plant design, procurement, licensing, start-up testing, and servicing.

1959 - 1967: U.S. Navy.

Engineering department head on a nuclear submarine. Qualified for Command of Submarines. Qualified Nuclear Ship Engineer Officer. Special operation. Shipyard overhaul-refueling.

PROFESSIONAL AFFILIATIONS:

American Nuclear Society (Fellow):

- Past Chair Professional Divisions Committee
- Past Chair Nuclear Reactor Safety Division.
- Past Member Board of Directors and Executive Committee.
- Member of Professional Divisions Committee and Executive Conference Committee.
- Conducted Professional Development Workshops in Root Cause Organizational Learning.
- Track Co-organizer, Session Chair/Organizer/Speaker for many Utility Working Conferences.

Sigma Xi (The Scientific Research Society of North America).
American Association for the Advancement of Science.
American Society for Quality (Senior Member).

PUBLICATIONS (partial listing):

Safety Culture:

Corcoran, W. R., "Safety Culture – Back to the Basics", Thirteenth Annual Human Performance, Root Cause Analysis, and Trending Conference, Monterey,CA (2007) (Proceedings 8th IEEE HFPP 13th HPRCT pp 218-224)

Corcoran, W. R., "Self-assessment and Safety Culture", American Nuclear Society Utility Working Conference, Amelia Island, FL (2006)

Event investigation:

Hartley, Richard S., Swaim, Dan J., and Corcoran, William R., Causal Factors Analysis: An Approach for Organizational Learning, B&W Pantex, October 2008

Corcoran, W. R., "New Root Cause Analysis Tools", Twelfth Annual Human Performance, Root Cause Analysis, and Trending Conference, Charleston, SC, (2006)

Corcoran, W. R., "The Learning Curves You Would See If You Were in a Learning Organization." American Nuclear Society Utility Working Conference, Amelia Island, FL (2005)

Corcoran, W. R., "Test Program Lessons to be Learned (A Collective Significance Analysis)", ANS Winter Meeting 2004, ANS Transactions (2004)

Corcoran, W. R., "Lessons to be Learned from Recent Events/Incidents", ANS Annual Meeting 2004, ANS Transactions, (2004)

Corcoran, W. R., "Defining and Analyzing Precursors", published in Phimister, J.R., Bier, V. M., and Kunreuther, H. C. (eds.) "Accident Precursor Analysis and Management", National Academies Press, Washington, DC (2004), http://books.nap.edu/books/0309092167/html/79.html#pagetop

Corcoran, W. R., "Precursors? I Don't See Any Precursors." American Nuclear Society Utility Working Conference, Amelia Island, FL (2003)

Corcoran, W. R., "Connecting the Dots-Clearly Connecting Cause Analysis and Human Performance", American Nuclear Society Utility Working Conference, Amelia Island, FL (2003)

Corcoran, W. R., Toline, B. C., Cooley, D. E., "Root Cause Analysis Mentoring", Ninth Annual Human Performance, Root Cause Analysis, and Trending Conference, Mystic, CT, June 2003

Corcoran, W. R., "The Firebird Forum" (electronic newsletter on root cause organizational learning) published more-or-less monthly since January 1998 and distributed to hundreds of high hazard industry professionals. Nuclear Safety Review Concepts, Windsor, CT (1998-Present) sample posted at http://www.plant-maintenance.com/articles/PhoenixAnalysis.pdf

Corcoran, W. R., "The Phoenix Handbook" (The Ultimate Event Evaluation Manual for Finding Profit Improvement in Adverse Events), Nuclear Safety Review Concepts, Windsor, CT (a textbook and handbook used in workshops and seminars conducted by the author, 450 pp.) (2003)

Corcoran, W. R., "Lessons to be Learned from a Near Miss Loss of Coolant Accident", ANS Winter Meeting 2002, ANS Transactions, 87, 40-41 (2002)

Corcoran, W. R., "Using the Internet for Root Cause Analysis", ANS Winter Meeting 2002, ANS Transactions, 87, 46-47 (2002)

Corcoran, W. R., "Root Cause Analysis of a Near Miss Loss of Coolant Accident", ANS Winter Meeting 2002, ANS Transactions, 87, 115-116 (2002)

Corcoran, W. R., "The Seven Habits of Highly Effective Root Cause Analysts", Seventh Annual Human Performance/ Root Cause/ Trending Workshop, Baltimore, MD (2001)

Corcoran, W. R., Professional Development Workshop, "Root Cause Analysis-a business approach", American Nuclear Society Meetings, Long Beach, CA (1999), San Diego, CA (2000), Milwaukee (2001)

Corcoran, W. R., "Recent Experience in High Hazard Industry Root Cause Analysis", Sixth Annual Human Performance/ Root Cause/ Trending Workshop, Philadelphia, PA (2000)
http://www.rootcauselive.com/Files/Investigative%20Processes/The%20Phoenix%20Approach.pdf

Corcoran, W. R., "Ownership Transfer as an Organizational Event", American Nuclear Society Winter Meeting, Long Beach, CA (1999)

Corcoran, W. R., "Measuring the Effect of Management on Performance -A Modern Biblical Paradigm", American Nuclear Society Winter Meeting, Long Beach, CA (1999), Invited paper. Summarized in *Trans. Am. Nucl. Soc.*, 81, 84-85 (1999)

Corcoran, W. R., Lengyel, G. J., and Gallogly, K. W., "Corrective Action Programs as Culture change Agents: The Thirteen Step Model", American Nuclear Society Utility Working Conference, Amelia Island, FL (1999)

Corcoran, W. R., Lengyel, G. J., and Pedersen, A., "The Thirteen Steps of a Wold Class Corrective Action Program", Fifth Annual Human Performance/ Root Cause/ Trending Workshop, Kansas City, MO (1999)

Corcoran, W. R., "Organizing Effective Root Cause Investigations", Fifth Annual Human Performance/ Root Cause/ Trending Workshop, Kansas City, MO (1999)

Corcoran, W. R., and Davis, S. M., "Organizational Improvements from Disasters: Effective Tools for Identifying Programmatic and Cultural Weaknesses", Fifth Annual Human Performance/ Root Cause/ Trending Workshop, Kansas City, MO (1999)

Corcoran, W. R., "Partial Phoenix Analysis of the Case of the Runaway Filter", Fifth Annual Human Performance/ Root Cause/ Trending Workshop, Kansas City, MO (1999)

Corcoran, W. R., Russell, L. B., Williams, M. B., Lohr, J. F., and Pieringer, P. A., "Collective Significance Analysis: A Self-assessment Process", ANS Winter Meeting, Washington, DC (1998). Summarized in *Trans. Am. Nucl. Soc.*, 79, 221-222 (1998)

Corcoran, W. R., Dodge, J. A., and Rondo, D. J., "Collective Significance Analysis Using the Phoenix Approach", ANS Winter Meeting, Washington, DC (1998). Summarized in *Trans. Am. Nucl. Soc.*, 79, 242-243 (1998)

Corcoran, W. R., Casella, F. A., and Dooley, G. D., "Anatomy of a Problem", ANS International Topical Meeting, Safety of Operating Reactors, San Francisco, CA, October, 1998, Proceedings of the American Nuclear Society International Topical Meeting on Safety of Operating Reactors, 405-409 (1998)

Corcoran, W. R., Casella, F. A., and Evans, R. W., "Impact-Based Root Cause Analysis", ANS International Topical Meeting, Safety of Operating Reactors, San Francisco, CA, October, 1998, Proceedings of the American Nuclear Society International Topical Meeting on Safety of Operating Reactors, 410-414 (1998)

Corcoran, W. R., Casella, F. A., and Evans, R. W., "Using the Cause-Consequence Impact Matrix for "Root Cause" Communication", ANS International Topical Meeting, Safety of Operating Reactors, San Francisco, CA, October, 1998, Proceedings of the American Nuclear Society International Topical Meeting on Safety of Operating Reactors, 410-414 (1998)

Casella, F. A. and Corcoran, W. R., "Organizational Learning at Rocky Flats", ANS Utility Working Conference,

Amelia Island, FL (1998)

Corcoran, W. R., and Casella, F. A., "Evaluation Criteria for Event Investigation Reports", ANS Annual Meeting, Nashville, TN (1998). Summarized in *Trans. Am. Nucl. Soc.*, 78, 178-180 (1998).

Corcoran, W. R., et al, "Consequence Reduction Through Systematic Organizational Learning", ANS Winter Meeting, Albuquerque, NM (1997). Summarized in *Trans. Am. Nucl. Soc.*, 77, 278-9 (1997).

Corcoran, W. R., "Benchmarking Organizational Learning", 1997 Utility Working Conference, Amelia Island, FL, August 17-20, 1997.

Corcoran, W. R., et al, "The Comparative TimeLine: Highlighting Human Performance Factors", 1997 IEEE Conference on Human Factors and Power Plants, Orlando, FL, June 8-12, 1997

Corcoran, W. R., "The Future of the Event Evaluation Process", invited paper for the ANS 1996 Annual Meeting, Reno, NV (1996) Summarized in *Trans. Am. Nucl. Soc.*, 74, 240-1 (1996).

Corcoran, W. R., "The Event Evaluation Process: Isn't it Time to Synchronize the Generator After a Fifteen Year Outage", invited keynote speech to the ANS Short Course on Root Cause Analysis, ANS 1996 Annual Meeting, Reno, NV (1996)

Corcoran, W. R., et. al., "Common Problems With Event Investigation Reports", ANS International Topical Meeting, Safety of Operating Reactors, Seattle, WA, September, 1995, Proceedings of the American Nuclear Society International Topical Meeting on Safety of Operating Reactors, 555-561 (1995)

Self-assessment:

Corcoran, W. R., "Crisis Learning in the U.S. Nuclear Power Industry", Transactions of the ANS 2001 Winter Meeting, pp. 121-2

Swanson, R. N. and Corcoran, W. R., "Performance Metrics Versus Management Needs", *Nuclear News*, **43**, 9, 30-33, August 2000

Corcoran, W. R. and Leggett, D. L., "Generic Oversight Review Principles and the Role of the Plant Operations Review Committee", ANS Winter Meeting, Albuquerque, NM (1997). Summarized in *Trans. Am. Nucl. Soc.*, 77, 284-5 (1997).

Corcoran, W. R., "Integrated Reactive Self-assessment for Programmatic Learning", invited paper for the ANS 1996 Winter Meeting, Washington, DC (1996). Summarized in *Trans. Am. Nucl. Soc.*, **75**, 233-4 (1996).

Corcoran, W. R., "Strategy: The Use of Self-assessment in Achieving Engineering Excellence", ANS Executive Conference in Jupiter Beach, FL, October 1993

Corcoran, W. R., "Nuclear Utility Self-assessment as Viewed from the Corporate Nuclear Safety Committee," ANS Annual Meeting, Boston, MA (1992). Summarized in *Trans. Am. Nucl. Soc.*, **65**, 354-5 (1992).

Corcoran, W. R., "The Fundamentals of Self-Assessment", a seminar presented to the USDOE 1991 Annual Conduct of Operations Workshop, Raleigh, NC, August 1991 and to the Eighth Annual Workshop of the Operating Reactor Safety Engineering and Review Groups (ORSERG) sponsored by EPRI/NSAC in Tampa, FL, September 1991.

Corcoran, W. R., "Self-Assessment at Nuclear Utilities", published by Tenera, L.P., October 1, 1990, 9 pp., also published in *Nuclear Plant Journal*, 9-2, 64-68, (March-April 1991). Presented at the MIT Summer Course on Nuclear Reactor Safety, July 1992 and 1993.

Quality:

Corcoran, W. R., et al, "Event-based Quality Criteria Training", ANS Winter Meeting, Albuquerque, NM (1997). Summarized in *Trans. Am. Nucl. Soc.*, 77, 281-2 (1997).

Corcoran, W. R., "Procedure Principles-Quality Procedure Programs from a Senior Management Perspective", *Procedures Review*, **3**, 2, February 1997 and **3**, 3, March 1997

Corcoran, W. R., "Regulatory Expectations for Trending in a Quality Assurance Program", Third Annual Nuclear

Industry Corrective Action Program Conference, Oak Brook, IL, June 17-20, 1997

Corcoran, W. R., et. al., "Common Assessment Problems", ANS International Topical Meeting, Safety of Operating Reactors, Seattle, WA, September, 1995 , Proceedings of the American Nuclear Society International Topical Meeting on Safety of Operating Reactors, 547-554 (1995)

Corcoran, W. R.,(Co-author),"Foundations for Quality: Enhancing the Culture", ANS International Topical Meeting, Safety Culture in Nuclear Installations, Vienna, Austria, April 1995

Corcoran, W. R.,(Co-author),"Audit Finding Closeout as a Culture Enhancing Practice", ANS International Topical Meeting, Safety Culture in Nuclear Installations, Vienna, Austria, April 1995

Corcoran, W. R.,(Co-author), "*Believe Your Indications* as Part of Conservative Decision Making and Safety Culture", ANS International Topical Meeting, Safety Culture in Nuclear Installations, Vienna, Austria, April 1995

Corcoran, W. R., "Foreign Material in Cooling Systems", DOE Risk Mgt. Qtrly, **2**, 3, (July 1994)

Corcoran, W. R., "NUCLEAR QUALITY ASSURANCE-The Quality Guide to 10 CFR 50, Appendix B", Published by PECO Energy Company, November 1994, April 1997, Baltimore Gas & Electric Company, January 1998

Corcoran, W. R., "The Fallacy of Joint Testing of Redundant, Diverse or Backup Devices", DOE Risk Mgt. Qtrly, **1**, 3, (July 1993). *Nucl. Plant J.*, **11**, 4, 57,66 (1993)

Corcoran, W. R., "Effective Problem Close-out", presented to the Eighth Annual Workshop of the Operating Reactor Safety Engineering and Review Groups (ORSERG) sponsored by EPRI/NSAC in Baltimore, MD, September 1993

Corcoran, W. R., et al, "Nuclear Quality Assurance Operating Philosophy-A Quality-Oriented Approach," ANS Topical Meeting, Boston, MA (1992). Summarized in *Trans. Am. Nucl. Soc.*, **65**, 523-4 (1992). Published in *Nucl. Plant J.*, **10**, 4, 88-90 (1992)

Corcoran, W. R., (co-author), "Verifying the Adequacy of Technical Specifications," ANS Winter Meeting (1982)," *Trans. ANS* **43**,555 (1982), C-E Publication TIS-7276

Accident Management:

Corcoran, W. R., "The Seven Habits of Highly Effective Operators", American Nuclear Society Utility Working Conference, Amelia Island, FL (2001)

Corcoran, W. R., "Transient Management Using the Safety Function Approach," ANS Topical Meeting on Anticipated and Abnormal Plant Transients in Light Water Reactors, Jackson, WY (1983)

Corcoran, W. R., (co-author), "The Application of the Safety Level Concept and Related Aviation and Aerospace Concepts to Light Water Reactors," ANS Annual Meeting (1981), *Trans. ANS* **38**,471 (1981), C-E Publication TIS-6821

Corcoran, W. R., (co-author), "The Plant Designer's View of the Operator's Role in Nuclear Plant Safety," Fourth Symposium on Training of Nuclear Facility personnel, Gatlinburg, TN (1981), C-E Publication TIS-6766

Corcoran, W. R., (co-author), "The Critical Safety Functions and Plant Operation," *Nuclear Technology, 55*, 690 - 712 12(1981), C-E Publication TIS-7158,
http://nuclear.tamu.edu/~burchill/609/Class%2001/Critical%20Safety%20Functions.pdf

Corcoran, W. R., (co-author), "The Use of Safety Functions in Emergency Procedure Guidelines," Proceedings of the ANS/ENS Topical Meeting on Thermal Reactor Safety, Knoxville, TN (1980), CONF-800403/V-II, pp. 1289-1296

Teambuilding & Management:

Corcoran, W. R., "Conservative Decision Making: A Part of the Nuclear Safety Culture", Transactions of the ANS 2001 Winter Meeting, pp. 151-2

Corcoran, W. R., et al, "The Principles of Nuclear Power Plant Operational Safety", published by Tenera, L.P., April 1993; MIT Nuclear Reactor Safety Course Lecture 1994, republished by Northeast Utilities, January 1996

Corcoran, W. R., "The Key Attributes of a Professional," *Nuclear Plant Journal* 7-1, 66 (January-February 1989), also published in *Communicator* (Professional Reactor Operator Society), IX (3), 19-20, Fall 1989, Presented at ANS Winter Meeting, Washington, DC, November 11-15, 1990

Corcoran, W. R., "Managerial Leadership in Practice," a textbook used in a course regularly taught by the author as part of the C-E Management Development Program, 155 pp. (1985)

Corcoran, W. R., "Management Teambuilding Skills," a textbook used in courses regularly taught by the author and others as part of the C-E Management Development Program, 441 pp. (1984)

Other:

Corcoran, W. R., "Regulating Safety Culture: Either a Bad Idea or Already Being Done", ANS Annual Meeting, San Diego, CA (2005), Summarized in *Trans. Am. Nucl. Soc.*, 92, 365-366 (2005)

Corcoran, W. R., and Swanson, R. N., "Correlation Between Regulatory Compliance and Safety as Revealed by Actual Events", ANS Winter Meeting, Washington, DC (1998). Summarized in *Trans. Am. Nucl. Soc.*, 79, 222-223 (1998)

Corcoran, W. R., Green, M. D., Caruthers G. F.,, Webster, S. A. , and Nandy, F. R., "Increased Plant Availability Through Technical Specification Improvement," (Combustion Engineering Publication TIS-7729), International Nuclear Power Plant Thermal Hydraulics and Operations Topical Meeting, Taipei, Taiwan (October 22-24, 1984).

W. E. Burchill, W. R. Corcoran, and J. W. Pfeifer, "C-E Response to TMI Regulatory Requirements," invited paper presented at ANS Annual Meeting, Trans. ANS 34: 596 (1980)

Corcoran, W. R., (co-author), "Damping of Xenon Oscillations in the Maine Yankee Reactor," ANS 6th Biennial Conference on Reactor Operating Experience, Myrtle Beach, SC (1973), also *Nuclear Technology, 22*, 252-262 (1974)