

## References<sup>1</sup>

Nuclear Power Plant Probabilistic Risk Assessment (PRA) and Risk-Informed Decision Making (RIDM)

Massachusetts Institute of Technology

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Aldemir, T. (ed.), *Advanced Concepts in Nuclear Energy Risk Assessment and Management*, World Scientific Publishing Co (2018). (Available from: <https://www.worldscientific.com/worldscibooks/10.1142/10587>)

Algama, D., et al., "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," draft report, U.S. Nuclear Regulatory Commission, June 2013. (ADAMS ML13133A132)

American Nuclear Society and the Institute of Electrical and Electronics Engineers, "PRA Procedures Guide," *NUREG/CR-2300*, January 1983.

American Society for Mechanical Engineers and American Nuclear Society, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," *ASME/ANS RA-Sa-2009, Addendum A to RA-S-2008*, ASME, New York, NY, American Nuclear Society, La Grange Park, Illinois, 2009.

American Society for Mechanical Engineers and American Nuclear Society Joint Committee on Nuclear Risk Management (JCNRM), "Codes & Standards" <https://cstools.asme.org/csconnect/CommitteePages.cfm?Committee=100186782>

Andersen, V.M., et al., "Seismic Probabilistic Risk Assessment Implementation Guide," *EPRI 3002000709*, Electric Power Research Institute, Palo Alto, CA, December 2013.

Apostolakis, G., "Probability and risk assessment: the subjectivistic viewpoint and some suggestions," *Nuclear Safety*, **9**, 305–315, 1978.

Apostolakis, G., "The concept of probability in safety assessments of technological systems," *Science*, 250, 1359–1364, 1990.

Apostolakis, G., et al., "A Proposed Risk Management Regulatory Framework," *NUREG-2150*, U.S Nuclear Regulatory Commission, April 2012.

Apostolakis, G. and A. Mosleh, "Expert opinion and statistical evidence: an application to reactor core melt frequency," *Nuclear Science and Engineering*, **70**, 135-149, 1979.

Atwood, C.L., et al., "Handbook of Parameter Estimation for Probabilistic Risk Assessment," *NUREG/CR-6823*, September 2003.

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<sup>1</sup> The following are a small subset of the vast literature on nuclear power plant PRA and RIDM.

- Barlow, R.E. and F. Proschan, *Statistical Theory of Reliability and Life Testing: Probability Models, Second Edition*, To Begin With, Silver Spring, MD, 1975.
- Barriere, M., et al., "An Analysis of Operational Experience During Low Power and Shutdown and a Plan for Addressing Human Reliability Assessment Issues," *NUREG/CR-6093*, June 1994.
- Beattie, J.R., G.D. Bell, and J.E. Edwards, "Methods for the Evaluation of Risk," *AHSB (S) R159*, UKAEA, 1969.
- Bell, G.D., "The calculated risk – a safety criterion," in F.R. Farmer (ed.), *Nuclear Reactor Safety*, Academic Press, London, 1977.
- Bickel, J.H., "Experiences of a U.S. Utility P.R.A. Team," Seminar, UK Atomic Energy Authority Safety and Reliability Directorate, June 28, 1983.
- Bier, V.M. (ed.), *Accident Sequence Precursors and Probabilistic Risk Analysis*, University of Wisconsin Press, Madison, WI, 1998.
- Bier, V.M., et al., *Accident Precursor Analysis and Management: Reducing Technological Risk Through Diligence*, Committee on Precursors, National Academy of Engineering, National Academies Press, New York, 2004.
- Birkhofer, A., "The German risk study for nuclear power plants," *IAEA Bulletin*, **22**, No. 5/6, October 1980.
- Bixler, N., et al., "MACCS Best Practices as Applied in the State-of-the-Art Reactor Consequence Analyses (SOARCA) Project," *NUREG/CR-7009*, August 2014.
- Blackman, H., N. Siu, and A. Mosleh, *Human Reliability Models: Theoretical and Practical Challenges*, Center for Reliability Engineering, University of Maryland, College Park, MD, 1998.
- Box, G.E.P. and G.C. Tiao, *Bayesian Inference in Statistical Analysis*, Addison-Wesley, Reading, MA, 1973.
- Bratley, P., B.L. Fox, and L.E. Schrage, *A Guide to Simulation, Second Edition*, Springer-Verlag, New York, 1987.
- Bye, A., et al., "International HRA Empirical Study – Phase 2 Report: Results from Comparing HRA Method Predictions to Simulator Data from SGTR Scenarios," *NUREG/IA-0216, Vol. 2*, August 2011.
- Chang, Y.J. and J. Xing, "The general methodology of an Integrated Human Event Analysis System (IDHEAS) for human reliability analysis method development," *Proceedings International Conference on Probabilistic Safety Assessment and Management (PSAM 13)*, Seoul, Korea, October 2-7, 2016.

Chu, T.L., et al., "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1: Analysis of Core Damage Frequency from Internal Events During Mid-Loop Operations," *NUREG/CR-6144, Vol. 2*, June 1994.

Chu, T.L., and W.T. Pratt, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1: Summary of Results," *NUREG/CR-6144, Vol. 1*, October 1995.

Covello, V.T. and F. Allen, "Seven Cardinal Rules of Risk Communication," *OPA-87-020*, U.S. Environmental Protection Agency, 1988.

Coyne, K.A., "Risk-Informed Regulation at the U.S. Nuclear Regulatory Commission," April 14, 2016. (ADAMS ML16105A427)

Dang, V.N., D.L. Deoss, and N. Siu, "Event simulation for availability analysis of dynamic systems," *Transactions of the Eleventh International Meeting on Structural Mechanics in Reactor Technology*, Tokyo, Japan, August 18-23, 1991, Volume M, pp. 31-36.

Dang, V.N., et al., "International HRA Empirical Study – Phase 3 Report: Results from Comparing HRA Methods Predictions to HAMMLAB Simulator Data on LOFW Scenarios," *NUREG/IA-0216, Vol. 3*, December 2014.

Downer, J., "Disowning Fukushima: managing the credibility of nuclear reliability assessment in the wake of disaster," *Regulation and Governance*, Wiley, 2013.

Downer, J., "The unknowable ceilings of safety: three ways that nuclear accidents escape the calculus of risk assessments," *The Ethics of Nuclear Energy: Risk, Justice, and Democracy in the Post-Fukushima Era*, B. Taebi and S. Roeser (eds.), Cambridge University Press, 2015.

Draxler, R., "An Overview of the HYSPLIT Modeling System for Trajectory and Dispersion Applications," National Oceanic and Atmospheric Administration, April 7, 2018. (Available from: <https://www3.epa.gov/scram001/9thmodconf/draxler.pdf>)

Droguett, E. and A. Mosleh, "Bayesian methodology for model uncertainty using model performance data," *Risk Analysis*, **28**, No. 5, 1457-1476, 2008.

Drouin, M., et al., "Glossary of Risk-Related Terms in Support of Risk-Informed Decisionmaking," *NUREG-2122*, U.S. Nuclear Regulatory Commission, November 2013.

Drouin, M., et al., "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking," *NUREG-1855, Rev. 1*, March 2017.

Dull, P.S., *A Battle History of the Imperial Japanese Navy (1941-1945)*, Naval Institute Press, Annapolis, MD, 1978.

Electric Power Research Institute and U.S. Nuclear Regulatory Commission Office of Nuclear Regulatory Research, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,"

*EPRI 1011989 and NUREG/CR-6850*, Electric Power Research Institute (EPRI), Palo Alto, CA and U.S. Nuclear Regulatory Commission, Washington, DC, 2005.

Electric Power Research Institute and U.S. Nuclear Regulatory Commission Office of Nuclear Regulatory Research, "Fire Probabilistic Risk Assessment Methods Enhancements: Supplement 1 to NUREG/CR-6850 and EPRI 1011989," *EPRI 1019259 and NUREG/CR-6850 Supplement 1*, Electric Power Research Institute (EPRI), Palo Alto, CA and U.S. Nuclear Regulatory Commission, Washington, DC, 2009.

Environmental Protection Agency, "PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents, *EPA-400/R-16/001*, November 2016.

Fischhoff, B., "Risk perception and communication unplugged: 20 years of process," *Risk Analysis*, **15**, 137–145, 1995.

Fischhoff, B., P. Slovic, and S. Lichtenstein, "Fault trees: sensitivity of estimated failure probabilities to problem representation," *Journal of Experimental Psychology: Human Perception and Performance*, 4, No. 2, 330-344, 1978.

Flatow, I., "Truth, Deception, and the Myth of the One-Handed Scientist," October 18, 2012. (Available from: <https://thehumanist.com/magazine/november-december-2012/features/truth-deception-and-the-myth-of-the-one-handed-scientist>)

Fleming, K.N., "A reliability model for common mode failure in redundant safety systems," *Proceedings Sixth Annual Pittsburgh Conference on Modeling and Simulation*, Pittsburgh, April 23-25, 1975.

Fleming, K.N., "Issues and Recommendations for Advancement of PRA Technology in Risk-Informed Decision Making," NUREG/CR-6813, April 2003.

Fleming, K.N., "Development of Pipework System Failure Rates: Where Do the Numbers Come From and Why Should We Believe Them?," CRA UK 5<sup>th</sup> Probabilistic Safety Analysis and Human Factors Assessment Forum, September 17-18, 2014.

Fleming, K.N. and A.M. Kalinowski, "An Extension of the Beta Factor Method to Systems with High Levels of Redundancy," Pickard, Lowe and Garrick, Inc., PLG-0289, June 1983.

Fleming, K.N. and B. Lydell, "Guidelines for Performance of Internal Flooding Probabilistic Risk Assessment," *EPRI 1019194*, Electric Power Research Institute, Palo Alto, CA, December 2009.

Food and Agriculture Organization of the United Nations/ World Health Organization, "Risk Characterization of Microbiological Hazards in Foods: Guidelines," *Microbiological Risk Assessment Series*, **17**, Rome, 2009.

Forester, J., et al., "Evaluation of Human Reliability Analysis Methods Against Good Practices," *NUREG-1842*, September 2006.

Forester, J., et al., "The International HRA Empirical Study: Lessons Learned from Comparing HRA Methods Predictions to HAMMLAB Simulator Data," *NUREG-2127*, August 2014.

J. Forester, et al., "The U.S. HRA Empirical Study: Assessment of HRA Method Predictions against Operating Crew Performance on a U.S. Nuclear Plant Simulator," *NUREG-2156*, June 2016.

Fuchida, M. and M. Okumiya, *Midway: The Battle that Doomed Japan, The Japanese Navy's Story*, U.S. Naval Institute, Annapolis, MD, 1955.

Garrick, B.J., "Lessons learned from 21 nuclear plant probabilistic risk assessments," *Nuclear Technology*, **84**, No. 3, 319–339(1989).

Gertman, D., et al., "The SPAR-H Human Reliability Analysis Method," *NUREG/CR-6883*, August 2005.

Gifford, I., C. Hunter, and A. Gilbertson, "U.S. Nuclear Regulatory Commission Accident Sequence Precursor Program: 2017 Annual Report," May 2018. (ADAMS ML18130A856)

Gorbachev, A., et al., "Report on flooding of Le Blayais power plant on 27 December 1999," *Proceedings of EUROSAFE 2000*, Cologne, Germany, November 6-7, 2000, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) GmbH, Cologne, Germany, 2000.

Government of Japan, "Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company, Final Report," Tokyo, Japan, 2012.

Granger Morgan, M., "Use (and abuse) of expert elicitation in support of decision making for public policy," *National Academy of Sciences Proceedings (NASP)*, **111**, No. 20, 7176-7184, May 20, 2014.

Green, A.E. and A.J. Bourne, *Reliability Technology*, Wiley-Interscience, London, 1972

Haskin, F.E., A.L. Camp, S.A. Hodge, and D.A. Powers, "Perspectives on Reactor Safety," *NUREG/CR-6042*, Revision 2, March 2002.

Hayns, M.R., "The evolution of probabilistic risk assessment in the nuclear industry," *Transactions Institute of Chemical Engineers*, **77**, Part B, 117-142, May 1999.

Helton, D., "Scoping Study on Advanced Modeling Techniques for Level 2/3 PRA," U.S. Nuclear Regulatory Commission, May 2009. (ADAMS ML091320447)

Idaho National Laboratory, "Mitigating System Performance Index (MSPI)," *Training Course P111: PRA Technology and Regulatory Perspectives, Module S*, U.S. Nuclear Regulatory Commission. (ADAMS M12160A497)

Institut de Protection et de Sûreté Nucléaire, Rapport Sur L'Inondation Du Site Du Blayais, Fontenay-aux-Roses, France, January 2000. (Available from:

[http://www.irsn.fr/FR/expertise/rapports\\_expertise/Documents/surete/rapport\\_sur\\_l\\_inondation\\_du\\_site\\_du\\_blayais.pdf](http://www.irsn.fr/FR/expertise/rapports_expertise/Documents/surete/rapport_sur_l_inondation_du_site_du_blayais.pdf))

Institute of Nuclear Power Operations, "Special Report on the Nuclear Accident at the Fukushima Daiichi Nuclear Power Station," *INPO 11-005*, Atlanta, GA, 2011.

International Atomic Energy Agency, "Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants," *IAEA SSG-3*, 2010.

International Atomic Energy Agency, "Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants," *IAEA SSG-4*, 2010.

International Atomic Energy Agency, "The Fukushima Daiichi Accident: Report by the IAEA Director General," *STI/PUB 1710*, Vienna, Austria, 2015.

International Atomic Energy Agency, "Safety Standards" <https://www.iaea.org/resources/safety-standards>

International Nuclear Safety Group, "A Framework for an Integrated Risk Informed Decision Making Process," *INSAG-25*, International Atomic Energy Agency, 2011.

Jackson, S.A., "Transitioning to Risk-Informed Regulation: The Role of Research," *NRC Commissioner Speech S-98-26*, 26<sup>th</sup> Annual Water Reactor Safety Meeting, October 26, 1998. (ADAMS ML003711267)

Kahneman, D. and P. Slovic, and A. Tversky (eds.), *Judgment Under Uncertainty: Heuristics and Biases*, Cambridge University Press, Cambridge, MA, 1982.

Kaplan, S. and B.J. Garrick, "On the quantitative definition of risk," *Risk Analysis*, **1**, 11–37(1981).

Kato, I., "Safe Shutdown of the Onagawa Nuclear Power Station—the Closest Boiling Water Reactors to the 3/11/11 Epicenter," *Proceedings Symposium on the Future of Nuclear Power*, University of Pittsburgh, March 27-28, 2012. Available from [https://www.thornburghforum.pitt.edu/sites/default/files/Nuclear%20Symposium%20report%20FINAL%20report%2011\\_5\\_12.pdf](https://www.thornburghforum.pitt.edu/sites/default/files/Nuclear%20Symposium%20report%20FINAL%20report%2011_5_12.pdf)

Kazarrians, M. and K. Busby, "Use of simplified risk assessment methodology in the process industry," *Proceedings International Conference Probabilistic Safety Assessment and Management (PSAM 14)*, Los Angeles, CA, September 16-21, 2018.

Kazarrians, M., N. Siu, and G. Apostolakis, "Fire risk analysis for nuclear power plants: methodological developments and applications," *Risk Analysis*, **5**, 33-51, 1985.

Keller, W. and M. Modarres, "A historical overview of probabilistic risk assessment development and its use in the nuclear power industry: a tribute to the late Professor Norman Carl Rasmussen," *Reliability Engineering and System Safety*, **89**, 271-285, 2005.

Kletz, T.A., *Improving Chemical Engineering Practices: A New Look at Old Myths of the Chemical Industry, Second Edition*, Hemisphere Publishing, New York, 1990.

Kolaczowski, A., et al., "Good Practices for Implementing Human Reliability Analysis," *NUREG-1792*, April 2005.

Kumamoto, H. and E.J. Henley, *Probabilistic Risk Assessment and Management for Engineers and Scientists, Second Edition*, IEEE Press, New York, 1996.

Lane, J., "U.S. NRC operational experience data collection program," presented at NEA Workshop on the Use of Operational Experience in PSA, Boulogne-Billancourt, France, April 26-27, 2018. (ADAMS ML18123A479)

Lewis, S. and S. Cooper, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines: Final Report," *EPRI 1023001/NUREG-1921*, July 2012.

Lewis, H.W., et al., "Risk Assessment Review Group Report to the U.S. Nuclear Regulatory Commission," *NUREG/CR-0400*, September 1978.

Lindeman, A. and S. Cooper, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines – Qualitative Analysis for Main Control Room Abandonment Scenarios, Supplement 1," *EPRI 3002009215/NUREG-1921, Supplement 1*, August 2017.

Lois, E., et al., "International HRA Empirical Study – Phase 1 Report: Description of Overall Approach and Pilot Phase Results from Comparing HRA Methods to Simulator Performance Data," *NUREG/IA-0216, Vol. 1*, November 2009.

Lydell, B., K.N. Fleming, and J.-F. Roy, "Analysis of possible aging trends in the estimation of piping system failure rates for internal flooding PRA," *Proceedings of 14th International Conference on Probabilistic Safety Assessment and Management (PSAM 14)*, Los Angeles, CA, September 16-21, 2018.

Marble, J.L., N. Siu, and K. Coyne, "Risk communication within a risk-informed regulatory decision-making environment," *Proceedings International Conference on Probabilistic Safety and Assessment (PSAM 11/ESREL 2012)*, Helsinki, Finland, June 25-29, 2012. (ADAMS ML120480139).

McGrattan, B., et al., "Fire Protection and Fire Research Knowledge Management Digest, 2013," *NUREG/KM-0003*, 2013.

McIntyre, T.J. and N. Siu, "Electric power recovery at TMI-1, a simulation model," *Proceedings of the International ANS/ENS Topical Meeting on Thermal Reactor Safety*, San Diego, California, February 2-6, 1986, pp. VIII.6-1 through VIII.6-7.

Miller, C., et al., "Recommendations for Enhancing Reactor Safety in the 21<sup>st</sup> Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, July 12, 2011. (ADAMS ML111861807)

Minarick, J.W. and C.A. Kukielka, "Precursors to Potential Severe Core Damage Accidents: 1969-1979, a Status Report," *NUREG/CR-2497*, June 1982.



Moieni, P., et al., "A PC-based human reliability analysis (HRA) software," *Proceedings ANS International Topical Meeting on Probabilistic Safety Assessment (PSA '93)*, Clearwater Beach, FL, January 26-29, 1993.

Mosleh, A., et al., "Procedures for Treating Common Cause Failures in Safety and Reliability Studies," *NUREG/CR-4780*, Vol. 1, January 1988.

Mosleh, A., et al., "Procedures for Treating Common Cause Failures in Safety and Reliability Studies," *NUREG/CR-4780*, Vol. 2, January 1989.

Mosleh, A., et al., *Model Uncertainty: Its Characterization and Quantification*, Center for Reliability Engineering, University of Maryland, College Park, MD, 1995. (Also available as *NUREG/CP-0138*)

Mosleh, A., "Delivering on the Promise: PRA, Real Decisions, and Real Events," Closing Plenary Talk, International Conference on Probabilistic Safety Assessment and Management (PSAM 11/ESREL 2012), Helsinki, Finland, June 25-29, 2012. (Available from: [http://www.iapsam.org/www.psam11.org/www/fi/program/PSAM11-ESREL\\_2012\\_CL-Fr4\\_Ali\\_Mosleh.pdf](http://www.iapsam.org/www.psam11.org/www/fi/program/PSAM11-ESREL_2012_CL-Fr4_Ali_Mosleh.pdf))

Mosleh, A. and N. Siu, "A multi-parameter common cause failure model," Proceedings 9th International Conference on Structural Mechanics in Reactor Technology, Lausanne, Switzerland, August 17-21, 1987.

Musicki, Z., et al., "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1: Analysis of Core Damage Frequency from Internal Fires During Mid-Loop Operations" *NUREG/CR-6144*, Vol. 3, July 1994.

National Aeronautics and Space Administration, "Organizational Risk and Opportunity Management: Concepts and Processes for NASA's Consideration," *NASA/SP-2014-615*, November 2016.

The National Diet of Japan, "The Official Report of the Fukushima Nuclear Accident Independent Investigation Commission," Tokyo, Japan, 2012.

National Fire Protection Association, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," *NFPA 805*, 2001 Edition, Quincy, MA, 2001. (Available through the NFPA Online Catalog at [www.nfpa.org](http://www.nfpa.org))

National Fire Protection Association, "Guide for the Evaluation of Fire Risk Assessments, 2013 Edition," *NFPA 551*, 2013.

National Institute of Standards and Technology, Annual Text Analytics Conference (<https://tac.nist.gov/>)

National Research Council, *Understanding Risk: Informing Decisions in a Democratic Society*, P.C. Stern and H.V. Fineberg (eds), National Academies Press, 1996.



National Research Council, *Lessons Learned from the Fukushima Accident for Improving Safety of U.S. Nuclear Plants*, National Academies Press, Washington, DC, 2014.

Nowlen, S.P., M. Kazarians, and F. Wyant, "Risk Methods Insights Gained from Fire Incidents," *NUREG/CR-6738*, September 2001.

Nuclear Energy Agency, "Shutdown and Low Power Safety Assessment" *NEA/CSNI/R(93)19*, Boulogne-Billancourt, France, November 1993. (Available from: <http://www.oecd-nea.org/nsd/docs/indexcsni.html>).

Nuclear Energy Agency, "Proceedings of the Workshop on Precursor Analysis," *NEA/CSNI/R(2003)11*, Boulogne-Billancourt, France, 2003, (Available from: <http://www.oecd-nea.org/nsd/docs/indexcsni.html>).

Nuclear Energy Agency, "Improving Low Power and Shutdown PSA Methods and Data to Permit Better Risk Comparison and Trade-Off Decision-Making, Vols. 1-3" *NEA/CSNI/R(2005)11/VOL1*, *NEA/CSNI/R(2005)11/VOL2*, and *NEA/CSNI/R(2005)11/VOL3*, Boulogne-Billancourt, France, September 2005, (Available from: <http://www.oecd-nea.org/nsd/docs/indexcsni.html>).

Nuclear Energy Agency, "Low Power and Shutdown Operations Risk: Development of Structure for Information Base and Assessment of Modelling Issues," *NEA/CSNI/R(2009)17*, Boulogne-Billancourt, France, December 2009, (Available from: <http://www.oecd-nea.org/nsd/docs/indexcsni.html>).

Nuclear Energy Agency, "Use and Development of Probabilistic Safety Assessment: An Overview of the Situation at the End of 2010", *NEA/CSNI/R (2012)11*, Boulogne-Billancourt, France, 2012. (Available from: <http://www.oecd-nea.org/nsd/docs/indexcsni.html>)

Nuclear Energy Agency, "International Workshop on Fire PRA: Workshop Proceedings," *NEA/CSNI/R(2015)12*, Boulogne-Billancourt, France, 2015. (Available from: <http://www.oecd-nea.org/nsd/docs/indexcsni.html>)

Nuclear Energy Agency, "CSNI Technical Opinion: Fire Probabilistic Safety Assessment for Nuclear Power Plants: 2019 Update," Boulogne-Billancourt, France, in publication.

Papoulis, A., *Probability, Random Variables, and Stochastic Processes*, McGraw-Hill, New York, 1965.

Persensky, J. et al., "Effective Risk Communication: The Nuclear Regulatory Commission's Guidelines for External Risk Communication," *NUREG/BR-0308*, January 2004.

Petroski, H., *To Engineer is Human: The Role of Failure in Successful Design*, Random House, New York, 1992.

Phimister, J.R., V.M. Bier, and H.C. Kunreuther, *Accident Precursor Analysis and Management: Reducing Technological Risk Through Diligence*, Committee on Precursors, National Academy of Engineering, National Academies Press, New York, 2004

Pietrangelo, A.R., Nuclear Energy Institute, "Industry support and use of PRA and risk-informed regulation," letter to A.M. Macfarlane, Chairman, U.S. Nuclear Regulatory Commission, December 19, 2013. (ADAMS ML13354B997)

Poucet, A., "Human Factors Reliability Benchmark Exercise: Synthesis Report," *EUR 1222 EN*, Ispra Joint Research Centre, Commission of European Communities, August 1989.

Pugh, M.C., "Probability Approach to Safety Analysis," *TRG Report 1949*, UKAEA, 1969.

Rasmuson, D. and N. Siu, "Treatment of Common-Cause Failures in SPAR Models," presented at Annual Meeting of NEA Working Group on Risk Assessment (WGRISK), Paris, France, April 20, 2007. (ADAMS ML070990049)

Raynaud, P., et al., "Important Aspects of Probabilistic Fracture Mechanics Analyses," *TLR-RES/DE/CIB-2018-01*, U.S. Nuclear Regulatory Commission, September 14, 2018. (ADAMS ML18178A431)

*Risk Analysis*, Special Issue on Nuclear Probabilistic Risk Analysis, **4**, No. 4, December 1984.

Rogovin, M. and G.T. Frampton, Jr., "Three Mile Island: A Report to the Commissioners and to the Public," Nuclear Regulatory Commission Special Review Group, January 1980.

Salley, M.H. and A. Lindeman, "Methods for Applying Risk Analysis to Fire Scenarios (MARIAFIRES) – 2012," *NUREG/CP-0303, EPRI 3002005205*, April 2016.

Samanta, P.K., et al, "Handbook of Methods for Risk-Based Analyses of Technical Specifications" *NUREG/CR-6141*, December 1994.

Shaney, L. and D. Miller, "Identification of External Hazards for Analysis in Probabilistic Risk Assessment: Update of Report 1022997," *EPRI 3002005287*, Electric Power Research Institute, Palo Alto, CA, October 2015.

Singpurwalla, N.D., *Reliability and Risk: A Bayesian Perspective*, Wiley, Chichester, 2006.

Siu, N., "A Monte Carlo method for multiple parameter estimation in the presence of uncertain data," *Reliability Engineering and System Safety*, **28**, No. 1, 59-98, 1990.

Siu, N., "Dynamic accident sequence analysis in PRA: a comment on 'Human Reliability Analysis - Where Shouldst Thou Turn?'," Technical Note, *Reliability Engineering and System Safety*, **29**, No. 3, 359-364, 1990.

Siu, N., "Risk assessment for dynamic systems: an overview," *Reliability Engineering and System Safety*, **43**, 43-73, 1994.

Siu, N., "Fire Risk Assessment for Nuclear Power Plants," FPE 580R – Fire Risk Assessment and Policy, Worcester Polytechnic Institute, December 2, 2015. (ADAMS ML15301A832)

Siu, N., "PSA Heterogeneity: Implications for Risk Aggregation," IAEA Consultancy Meeting on Development of a Methodology for Aggregation of Various Risk Contributors for Nuclear

Facilities,” International Atomic Energy Agency, Vienna, Austria, April 10-13, 2017. (ADAMS ML17093A744)

Siu, N., “PRA R&D – Changing the Way We Do Business?” Invited Plenary Lecture, *ANS International Topical Meeting on Probabilistic Safety Assessment (PSA 2017)*, Pittsburgh, PA, September 24-28, 2017. (ADAMS ML17263B165)

Siu, N., and G. Apostolakis, "A Methodology for Analyzing the Detection and Suppression of Fires in Nuclear Power Plants," *Nuclear Science and Engineering*, 94, 213-226, November 1986.

Siu, N., J.T. Chen, and E. Chelliah, “Research Needs in Fire Risk Assessment,” *NUREG/CP-0162, Vol. 2*, 25th Water Reactor Safety Information Meeting Bethesda, MD, October 20-22, 1997.

Siu, N. and K. Coyne, “Knowledge Engineering at a Risk-Informed Regulatory Agency: Challenges and Suggestions,” in *Knowledge in Risk Assessment and Management*, T. Aven and E. Zio, eds., Wiley, 2018.

Siu, N., K. Coyne, and F. Gonzalez, “Knowledge Management and Knowledge Engineering at a Risk-Informed Regulatory Agency: Challenges and Suggestions,” U.S. Nuclear Regulatory Commission, March 2017. (ADAMS ML17089A538)

Siu, N., K. Coyne, and N. Melly, “Fire PRA maturity and realism: a technical evaluation,” U.S. Nuclear Regulatory Commission, March 2017. (ADAMS ML17089A537)

Siu, N., et al., “PSA technology challenges revealed by the Great East Japan Earthquake,” *Proceedings of PSAM Topical Conference in Light of the Fukushima Dai-Ichi Accident*, Tokyo, Japan, April 15-17, 2013. (ADAMS ML13038A203)

Siu, N., et al., “Probabilistic Risk Assessment and Regulatory Decisionmaking: Some Frequently Asked Questions,” *NUREG-2201*, U.S. Nuclear Regulatory Commission, September 2016.

Siu, N., et al., “PSA technology reminders and challenges revealed by the Great East Japan Earthquake: 2016 update,” *Proceedings of 13th International Conference on Probabilistic Safety Assessment and Management (PSAM 13)*, Seoul, Korea, October 2-7, 2016. (ADAMS ML16245A822)

Siu, N., et al., “Accidents, near misses, and probabilistic analysis: on the use of CCDPs in enterprise risk monitoring and management,” *Proceedings of ANS International Topical Meeting on Probabilistic Safety Assessment (PSA 2017)*, Pittsburgh, PA, September 24-28, 2017. (ADAMS ML17268A021)

Siu, N., et al., “Qualitative PRA insights from operational events,” *Proceedings of 14th International Conference on Probabilistic Safety Assessment and Management (PSAM 14)*, Los Angeles, CA, September 16-21, 2018. (ADAMS ML18135A109)

Siu, N., D. Karydas, and J. Temple, "Bayesian Assessment of Modeling Uncertainty: Application to Fire Risk Assessment," in *Analysis and Management of Uncertainty: Theory and Application*, B.M. Ayyub, M.M. Gupta, and L.N. Kanal, eds., North-Holland, 1992, pp. 351-361.

Siu, N. and D.L. Kelly, "On the Use of Importance Measures for Prioritizing Systems, Structures, and Components," *Proceedings 5th International Topical Meeting on Nuclear Thermal Hydraulics, Operations, and Safety (NUTHOS-5)*, Beijing, China, April 14-18, 1997, pp. L.4-1 through L.4-6.

Siu, N. and D.L. Kelly, "Bayesian parameter estimation in probabilistic risk assessment," *Reliability Engineering and System Safety*, **62**, 89-116, 1998.

Siu, N., N. Melly, S. P. Nowlen, and M. Kazarians, "Fire Risk Assessment for Nuclear Power Plants," *The SFPE Handbook of Fire Protection Engineering, 5th Edition*, Springer-Verlag, New York, 2016.

Swain A.D. and H.E. Guttman, "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications: Final Report," *NUREG/CR-1278*, August 1983.

Szabo, A., et al., "Effective Risk Communication: Guidelines for Internal Risk Communication," *NUREG/BR-0318*, December 2004.

Takano, M., et al., "Reactivity accident of nuclear submarine near Vladivostok, *Journal of Nuclear Science and Technology*," **38**, No. 2, 143-157, 2001.

Tobin, M., K. Coyne, and N. Siu, "Current PRA knowledge management activities at the NRC," *Proceedings PSA 2011 International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA 2011)*, Wilmington, NC, March 13-17, 2011.

Tokyo Electric Power Company, Inc., "Fukushima Nuclear Accident Analysis Report," Tokyo, Japan, 2012.

U.S. Code of Federal Regulations, "Fire Protection," *10 CFR 50.48*, June 16, 2004, last amended Aug. 28, 2007.

U.S. Department of Energy, Electric Power Research Institute, Environmental Protection Agency, Federal Emergency Management Agency, Institute of Nuclear Power Operations, and the U.S. Nuclear Regulatory Commission, "Report on the Accident at the Chernobyl Nuclear Power Station," *NUREG-1250*, January 1987.

U.S. Nuclear Regulatory Commission, "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants," *WASH-1400, (NUREG-75/014)*, October 1975.

U.S. Nuclear Regulatory Commission, "Safety Goals for the Operation of Nuclear Power Plants; Policy Statement; Correction and Republication," *Federal Register*, **51**, p. 30028 (51 FR 30028), August 21, 1986.

U.S. Nuclear Regulatory Commission, "Loss of Vital AC Power and the Residual Heat Removal System During Mid-Loop Operations at Vogtle Unit 1 on March 20, 1990," *NUREG-1410*, June 1990.

U.S. Nuclear Regulatory Commission, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," *NUREG-1150*, December 1990.

U.S. Nuclear Regulatory Commission, "Workshop on the Use of PRA Methodology for the Analysis of Reactor Events and Operational Data," *NUREG/CP-0124*, 1992.

U.S. Nuclear Regulatory Commission, "Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States," *NUREG-1449*, September 1993.

U.S. Nuclear Regulatory Commission, "A Review of NRC Staff Uses of Probabilistic Risk Assessment," *NUREG-1489*, March 1994.

U.S. Nuclear Regulatory Commission, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities; Final Policy Statement," *Federal Register*, **60**, p. 42622 (60 FR 42622), August 16, 1995.

U.S. Nuclear Regulatory Commission, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," *NUREG-1560*, December 1997.

U.S. Nuclear Regulatory Commission, "White paper on risk-informed and performance-based regulation," *SECY-98-144*, June 22, 1998. (ADAMS ML003753601)

U.S. Nuclear Regulatory Commission, "Technical Basis and Implementation Guidelines for A Technique for Human Event Analysis (ATHEANA)," *NUREG-1624, Rev. 1*, May 2000.

U.S. Nuclear Regulatory Commission, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," *NUREG-1738*, February 2001.

U.S. Nuclear Regulatory Commission, "Perspectives Gained from the Individual Plant Examination of External Events (IPEEE) Program," *NUREG-1742*, April 2002.

U.S. Nuclear Regulatory Commission, "Davis-Besse Reactor Pressure Vessel Head Degradation: Overview, Lessons Learned, and NRC Actions Based on Lessons Learned," *NUREG/BR-0353, Rev. 1*, August 2008.

U.S. Nuclear Regulatory Commission, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," *Regulatory Guide 1.200, Revision 2*, March 2009. (ADAMS ML090410014)

U.S. Nuclear Regulatory Commission, "Significance Determination Process," *Inspection Manual Chapter 0609*, June 2, 2011. (ADAMS ML101400479)

U.S. Nuclear Regulatory Commission, "Resolution of Generic Safety Issues: Introduction," *NUREG-0933*, Main Report with Supplements 1–34, latest version available from <http://nureg.nrc.gov/sr0933/Introduction/Introductions.html>, December 2011.

U.S. Nuclear Regulatory Commission, “Notices of Enforcement Discretion,” *Inspection Manual Chapter 0410*, October 4, 2012. (ADAMS ML12263A456)

U.S. Nuclear Regulatory Commission, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making,” *NUREG-1855, Revision 1*, March 2013.

U.S. Nuclear Regulatory Commission, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants—Final Report,” *NUREG-1437, Revision 1*, June 2013.

U.S. Nuclear Regulatory Commission, “Glossary of Risk-Related Terms in Support of Risk-Informed Decisionmaking,” *NUREG-2122*, November 2013. (ADAMS Accession No. ML13311A353)

U.S. Nuclear Regulatory Commission, “The Browns Ferry Nuclear Plant Fire of 1975 Knowledge Management Digest,” *NUREG/KM-0002, Rev. 1*, February 2014.

U.S. Nuclear Regulatory Commission, “Integrated Risk-Informed Decision-Making Process for Emergent Issues,” *Office of Nuclear Reactor Regulation Office Instruction LIC-504, Revision 4*, June 2, 2014. (ADAMS ML14035A143)

U.S. Nuclear Regulatory Commission, “NRC Incident Investigation Program,” *Management Directive 8.3*, June 25, 2014. (ADAMS ML13175A294)

U.S. Nuclear Regulatory Commission, “Generic Issues Program,” *Management Directive 6.4*, January 15, 2015. (ADAMS ML14245A048)

U.S. Nuclear Regulatory Commission, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” *Regulatory Guide 1.174, Revision 3*, January 2018. (ADAMS ML17317A256)

U.S. Nuclear Regulatory Commission, “Achieving modern risk-informed regulation,” *SECY-18-0060*, May 23, 2018. (ADAMS ML18110A187).

U.S. Nuclear Regulatory Commission, “Information Digest: 2018-2019,” *NUREG-1350, Vol. 30*, August 2018. (ADAMS ML18226A114).

U.S. Nuclear Regulatory Commission, “Principles of Good Regulation” (ADAMS ML14135A076)

U.S. Nuclear Regulatory Commission, “Industry Average Parameter Estimates,” <https://nrcoe.inl.gov/resultsdb/AvgPerf/>

U.S. Nuclear Regulatory Commission, “Reliability and Availability Data System (RADS)” <https://nrcoe.inl.gov/resultsdb/RADS/>

U.S. Nuclear Regulatory Commission, “Risk-Informed Activities” <https://www.nrc.gov/about-nrc/regulatory/risk-informed/rpp.html>

U.S. Nuclear Regulatory Commission, “ROP References” <https://www.nrc.gov/reactors/operating/oversight/program-documents.html>

Vesely, W.E., et al., "Fault Tree Handbook," *NUREG-0492*, January 1981.

Vesely, W.E., et al., "Measures of Risk Importance and Their Applications," *NUREG/CR-3385*, 1983.

Vial, E., V. Rebour, and B. Perrin, "Severe storm resulting in partial plant flooding in 'Le Blayais' nuclear power plant," *Proceedings of International Workshop on External Flooding Hazards at Nuclear Power Plant Sites*, Atomic Energy Regulatory Board of India, Nuclear Power Corporation of India, Ltd., and International Atomic Energy Agency, Kalpakkam, Tamil Nadu, India, August 29 – September 2, 2005.

Walker, J.S. and T.R. Wellock, "A Short History of Nuclear Regulation, 1946-2009," *NUREG/BR-0175*, October 2010.

Wellock, T.R., "A figure of merit: quantifying the probability of a nuclear reactor accident," *Technology and Culture*, **58**, No. 3, 678-721, July 2017.

Whaley, A.M., et al., "Cognitive Basis for Human Reliability Analysis," *NUREG-2114*, January 2016.

Whitehead, D.W., et al., "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Grand Gulf Unit 1: Analysis of Core Damage Frequency from Internal Events for Plant Operational State 5 During a Refueling Outage," *NUREG/CR-6143*, 1994.

Wierman, T.E., et al., "Common-Cause Failure Database and Analysis System: Event Data Collection, Classification, and Coding," *NUREG/CR-6268, Rev. 1*, September 2007.

Winkler, R.L. and W.L. Hays, *Statistics: Probability, Inference and Decision, Second Edition*, Holt, Rinehart and Winston, New York, 1975.

Xing, J. and S. Morrow, "White Paper: Practical Insights and Lessons Learned on Implementing Expert Elicitation," U.S. Nuclear Regulatory Commission, October 13, 2016. (ADAMS ML16287A734)

Xing, J., et al., "An Integrated Human Event Analysis System (IDHEAS) for Nuclear Power Plant Internal Events At-Power Application," *NUREG-2199, Vol. 1*, March 2017.

Zio, E. and N. Pedroni, "How to effectively compute the reliability of a thermal-hydraulic passive system," *Nuclear Engineering and Design*, **241**, 310-327, 2011