Meng Yue

Education

1998 - 2002: Michigan State University, East Lansing, MI
Ph.D. in Electrical Engineering
Dissertation: "Bifurcation Subsystem Method and Its Applications in Analysis and Control Design for Power Systems"

1992 - 1995: Tianjin University, Tianjin, P.R.China
M.S. in Electrical Engineering
Thesis: "Parallel Processing of Kalman Filter and Adaptive Perturbation Control of a PUMA 560 Robot"

1986 - 1990: Xi'an University of Technology, Xi'an, P.R.China
B.S. in Electrical Engineering

Experiences

2009 – present: Brookhaven National Laboratory, Upton, NY
Scientist in Energy Sciences and Technology Department and Sustainable Energy Technologies Department

Investigation of Reactor Protection System (RPS) Software Reliability Using Statistical Testing Method
Studying methods to capture the operational profile of RPS of nuclear power plants for testing purpose;
Studying quantification method considering the testing results and software internal structure;

Investigation of RPS Software Reliability Using Bayesian Belief Network (BBN) Method
Studying a BBN structure for modeling software life cycle to capture the qualitative evidence that affect the software reliability by using expert elicitation;
Developed a scheme for converting the qualitative evidence to quantitative software reliability based on collected operating experience of RPS in nuclear power plants.

Solar Energy Source Evaluation for Smart Grid Development
Developed generic models for solar power generation and battery energy storage systems and their interfaces with the grid;
Proposed a modified maximum power point tracking (MPPT) algorithm and validated its effectiveness via a simulation;
Developed control schemes for reactive power control and/or frequency control scheme for the grid-tied inverters;
Implemented and integrated the models and controllers into a Matlab-based simulation tool EPTOOL that is applicable for many different research purposes.

Complex Networks Approach to Power Grid Design and Stability
Reviewed the literature on complex networks approach to power grid analysis;
Provided power flow software and raw data regional power grid provided and technical support for perform the study.

Susceptibility of Nuclear Stations to External Faults:
Developed a systematic scheme for selecting faults that may contribute to the reactor trip based on the significance of the impact;
Developed models for evaluating the impacts by considering different protection schemes and performed simulations of the selected scenarios.

Nuclear Energy Agency WGRisk (Working Group on Risk Assessment) for Digital I&C Reliability:
Provided inputs on hardware and software failure modes of digital systems;
Development of failure mode taxonomy for both hardware and software of digital systems by summarizing inputs from different member countries in the WGRisk DIGREL group.

Review and Preliminary Development of Quantitative Software Reliability Methods
Review of available methods for quantifying software reliability including software

reliability growth methods, Bayesian belief network, and statistical testing;
Developed a theoretical framework of discrete software reliability growth methods;
Studied preliminary scheme for modeling nuclear safety-critical software using Bayesian belief network and statistical testing methods;
Developed test configurations to test safety-critical software for reliability quantification.
Fukushima accident analysis:
Developed Markov model for risk analysis of Fukushima accident and performed analysis using PRCALC.

2007 – 2009: Brookhaven National Laboratory, Upton, NY
Associate Scientist in Energy Sciences and Technology Department
Digital System Reliability Analysis
Performed FMEAs of the digital feedwater control system (DFWCS) at different levels of detail for a refined failure mechanism of the DFWCS;
Proposed a simulator to evaluate impacts on the feedwater system of individual failures and combination of individual failures;
Quantified the failure probability of the feedwater system by developing an analytical solution to a fully expanded Markov model representing the combinations of the component failure sequences of the DFWCS.
Proliferation Resistance and Physical Protection Study of Nuclear Energy Systems
Proliferation and Physical Protection Study of Small Grid Appropriate Reactors
Advanced PRA Methods Research and Development Support

2005 – 2007: Brookhaven National Laboratory, Upton, NY
Assistant Scientist in Department of Energy Science and Technology
Reliability Study of Interlock Systems in National Synchrotron Light Source:
Reviewed PLC and relay logic based interlock system designs for potential radiation area;
Update reliability data for electrical components related to interlock systems;
Developed integrated fault tree for the reliability analysis of the whole interlock system using Sapphire.
Digital System Reliability Analysis:
Reliability data analysis using a hierarchical Bayesian analysis for digital I&C systems;
Review hardware and software design of digital reactor protection systems and digital feedwater control system;
Failure Mode and Effect Analysis (FMEA) of digital system hardware and software for reactor protection system and digital feedwater control system.
Proliferation Resistance and Physical Protection Study of Nuclear Energy Systems:
Analyzed material flow inside the front-end and back-end fuel cycles and reprocessing facilities of nuclear energy system;
Developed Markov Model for PRA based evaluation of proliferation resistance and physical protection of nuclear energy systems;
Developed a Matlab-based PR & PP evaluation software PRCALC to implement the Markov analysis.

2003 – 2005: Brookhaven National Laboratory, Upton, NY
Research Associate in Department of Energy Science and Technology
Developed a Matlab-based integrated power system analysis and simulation tool—EPTOOL;
Developed a probabilistic assessment of reliability and security of power transmission and distribution network using event tree and fault tree techniques.

2002 – 2003: Intellicon Inc., Holt, MI
Power System Research Specialist
Preventive, Corrective, and Stabilizing Control for Power System Contingency

Identified subsystems that may lead to and provide cures for cascaded voltage instability using PTI PSS/E and GE PSLF load flow and dynamics software;
Developed and implemented preventive and corrective control for voltage instability via voltage set point adjustment, active and reactive power generation dispatch, and load shedding.

Publications

Journals:

Published:

1. M. Yue, L. Cheng, and R. A. Bari, "Relative Proliferation Risks for Different Fuel Cycle Arrangements," *Nuclear Technology*, Vol. 165, January, 2009
2. M. Yue, L. Cheng, and R. A. Bari, "A Markov Model Approach to Proliferation Resistance Assessment of Nuclear Energy Systems," *Nuclear Technology*, Vol. 162, No. 26, April, 2008
3. M. Yue and R. Schlueter, "Robust Control Designs for Multiple Bifurcations," *IEEE Transactions on Power Systems,* Vol. 20, No. 1, pp. 301 – 311, Feb., 2005
4. M. Yue and R. Schlueter, "Bifurcation Subsystem and Its Applications in Power System Analysis," *IEEE Transactions on Power Systems*, Vol. 19, No. 4, pp. 1885 – 1893, Nov., 2004
5. M. Yue and R. Schlueter, "μ-synthesis Power System Stabilizer Design Using a Bifurcation Subsystem Based Methodology," *IEEE Transactions on Power Systems*, Vol. 18, No. 4, pp. 1497 – 1506, Nov., 2003
6. M. Yue and R. Schlueter, "An Algorithm and Properties Enabling Identification of Bifurcation Subsystems," *Journal of Electric Power Components and Systems*, Vol. 33, No. 6, Jun., 2005
7. M. Yue and R. Schlueter, "Bifurcation Subsystem Method Based Classification for Power System Stability Problems," *Journal of Electric Power Components and Systems,* Vol. 33, No. 2, pp. 213 – 231, Feb., 2005
8. M. Yue and R. Schlueter, "Nonlinear Effects of a Robust Control Design," *Power Engineering Letters, IEEE Transactions on Power Systems*, Vol. 20, No. 1, pp. 508 – 510, Feb., 2005
9. M. Yue and R. Schlueter, "Classification of Types, Classes, and Agents of Power System Bifurcations," *IEEE Power Engineering Society Letters*, Vol. 22, No. 8, pp. 55 – 57, Aug., 2002

Under Review:

10. M. Yue, Lap-Yan Cheng, and R. Bari, "Modeling and Evaluating Proliferation Resistance of Nuclear Energy Systems for Strategy Switching Proliferation," submitted to Annals of Nuclear Energy, under review.
11. T. L. Chu and M. Yue, "Analytical Calculation of the Mean Value of a Top Event," submitted to Reliability Engineering and System Safety, under review.

Under Preparation:

12. "Modeling of a Hybrid Solar/Battery Energy Storage System and Grid Integration Study," manuscript finished.
13. "Uncertainty Analysis and Sensitivity Calculations for Reliability Assessment of a Digital Feedwater Control System," manuscript finished and to be submitted to Reliability Engineering and System Safety.
14. "A Generic Framework for Reliability Assessment of Digital Systems: Part I," to be submitted to IEEE Transactions on Reliability.
15. "A Generic Framework for Reliability Assessment of Digital Systems: Part II," to be submitted to IEEE Transactions on Reliability.

Conferences:

1. M. Yue, X. Wang, M. Villaran, and R. Lofaro, "A Simulation-based Approach for Determining the Permissible Penetration Levels of Solar Generation," Submitted to *Solar*

Power International Conference, 2012

2. T. L. Chu, M. Yue, and W. Postma, "A Comparison of Taxonomies of Digital System Failure Modes," Accepted by *International Conference on Probabilistic Safety Assessment and Management (PSAM),* 2012
3. T. L. Chu, M. Yue, et al, "A Case Study on Applying Bayesian Belief Network Method to Quantifying Software Failure Probability of a Protection System," Accepted by *ANS International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human Machine Interface Technologies (NPIC/HMIT),* 2012.
4. Coauthored "Markov Model of Severe Accident Progression and Management," Accepted by *International Conference on Probabilistic Safety Assessment and Management (PSAM),* 2012.
5. T. L. Chu, M. Yue, G. Martinez-Guridi, and J. Lehner, "Review of Quantitative Software Reliability Methods," *ANS International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA),* 2011.
6. M. Yue, T. L. Chu et al, "Uncertainty Analysis and Sensitivity Calculations for Reliability Assessment of a Digital Feedwater Control System," *ANS International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA),* 2011.
7. M. Yue, M. Villaran, R. Lofaro, and X. Wang, "Detailed Modeling and Integration Study of Grid-Connected Solar PV Generation with Energy Storage and Power-Factor Control Capability," *Solar Power International Conference*, October, 2011
8. M. Yue, T. -L., Chu *etal*, "Uncertainty Analysis and Sensitivity Calculations for Reliability Assessment of a Digital Feedwater Control System," *ANS International Topical Meeting on Probabilistic Safety Assessment and Analysis,* 2011
9. T. L. Chu, M. Yue, G. Martinez-Guridi, and J. Lehner, "A Generic Failure Modes and Effects Analysis (FMEA) Approach for Reliability Modeling of Digital Instrumentation and Control (I&C) Systems," *International Conference on Probabilistic Safety Assessment and Management (PSAM)*, Seattle, Washington, June 7-11, 2010.
10. T. L. Chu, G. Martinez-Guridi, M. Yue, P. Samanta, G. Vinod, and J. Lehner, "Establishing a Philosophical Basis for Probabilistic Modeling of Software Failures," *International Conference on Probabilistic Safety Assessment and Management (PSAM)*, Seattle, Washington, June 7-11, 2010.
11. T. -L. Chu, M. Yue *etal*, "A Markov Model for Assessing the Reliability of a Digital Feedwater Control System," *ANS Nuclear Plant Instrumentation, Controls, Human Machine Interface Technology*, April, 2009
12. M. Yue, T.-L. Chu *etal*, "An Automated Tool for Supporting FMEAs of Digital Systems," *ANS Probabilistic Safety Assessment and Analysis*, September, 2008
13. T. L. Chu and M. Yue, "Analytical Calculation of the Mean Value of a Top Event," *International Conference on Probabilistic Safety Assessment and Management (PSAM)*, 2008
14. M. Yue, L. Cheng, and R. A. Bari, "A Comparison of Proliferation Resistance Measures of Misuse Scenarios Using A Markov Model Approach," *ANS 16th International Conference on Nuclear Engineering (ICONE 16)*, May, 2008
15. L. Cheng, M. Yue, and R. A. Bari, "Relative Proliferation Risks for Nuclear Fuel Leasing Arrangements," *the Proceedings of American Nuclear Science Winter Meeting,* 2007
16. M. Yue, L. Cheng, and R. Bari, "Methodology for Proliferation Resistance for Advanced Nuclear Energy Systems," *International Conference on Probabilistic Safety Assessment and Management (PSAM)*, 2006
17. M. Yue and T. L. Chu, "Probabilistic Reliability Modeling for Digital Component Using a Hierarchical Bayesian Method," *International Conference on Probabilistic Safety Assessment and Management (PSAM)*, 2006
18. M. Yue, L. Cheng, and R. A. Bari, "Markov Methodology for Proliferation Resistance of Nuclear Energy Systems," *29th European Safety, Reliability & Data Association (ESReDA) Seminar: Systems Analysis for a More Secure World*, 2005, Ispra, Italy
19. M. Yue, L. Cheng, I. A. Papazoglou, M. A. Azarm, and R. A. Bari, "Calculations of Proliferation Resistance for Generation III Nuclear Energy Systems," *the Global 2005 International Conference of Nuclear Energy System for Future Generation and Global*

Sustainability, Japan

20. M. Yue, L. Cheng, and R. A. Bari, "Quantitative Assessment of Probabilistic Measures for Proliferation Resistance," *American Nuclear Science Winter Meeting,* 2005
21. M. Yue, R. Schlueter, M. A. Azarm, and R. Bari, "Multiple Oscillation Stabilizing Control", *Power System Conference & Exposition,* Oct., 2004
22. M. A. Azarm, R. Bari, M. Yue, and Z. Musicki, "Electrical Substation Reliability Evaluation with Emphasis on Evolving Interdependence on Communication Infrastructure," *8th International Conference on Probabilistic Method Applied to Power Systems*, Sep., 2004
23. M. Yue and R. Schlueter, "μ-synthesis Power System Stabilizer Design Using a Bifurcation Subsystem Based Methodology," *IEEE PES General Meeting,* June, 2004
24. M. Yue and R. Schlueter, "A Model and Controller Reduction Method for Robust Control Design," *North American Power Symposium*, pp. 509 – 514, Oct., 2003
25. M. Yue and R. Schlueter, "A μ-synthesis Robust SVC Control Design," *IEEE PES Transmission and Distribution Conference*, Vol. 2, pp. 705 – 710, Sep., 2003
26. M. Yue and R. Schlueter, "Bifurcation Subsystem Identification," *IEEE PES General Meeting*, Vol. 3, pp. 1599 – 1604, July, 2002
27. M. Yue and R. Schlueter, "Bifurcation Subsystem for Saddle-node Bifurcation," *North American Power Symposium*, pp. 42 – 48, Oct., 2001
28. M. Yue and R. Schlueter, "Bifurcation Subsystem for Hopf Bifurcation," *North American Power Symposium*, pp. 49 – 56, Oct., 2001
29. M. Yue and N. Xi, "Dynamic Workspace Analysis and Motion Planning for a Micro Walking Robot," *IEEE/RSJ International Conference on Intelligent Robots and System*, Vol. 3, pp. 1900 – 1905, Oct., 2000
30. M. Yue, M. Minor, N. Xi, and R. Mukherjee, "Kinematics Workspace Analyses of a Miniature Walking Robot," *IEEE/RSJ International Conference on Intelligent Robots and System*, Vol. 3, pp. 1798 – 1803, Oct., 1999
31. M. Yue, N. Sunderarajan, and P. Saratchandran, "Minimal Radial Basis Function Neural Network (M-RAN) for Control of a Two-link Flexible Robot," *International Conference on Control, Automation, Robotics, and Vision*, 1998

Selected Technical Reports:

1. T. L. Chu, M. Yue et al, "Development of Quantitative Software Reliability Models for Digital Protection Systems of Nuclear Power Plants," Draft NUREG/CR-7044, 2012.
2. M. Villaran and M. Yue, "Susceptibility of Nuclear Stations to External Faults," Draft NUREG Report, submitted to Nuclear Regulatory Commissions, 2011
3. T. L. Chu, M. Yue et al, "Review of Quantitative Software Reliability Methods," Letter Report BNL-94047-2010, 2010.
4. T. L. Chu, M. Yue et al, "Modeling a Digital Feedwater Control System Using Traditional Probabilistic Risk Assessment Methods," NUREG/CR-6997, 2009
5. T. L. Chu, G. Martinez-Gurdi, M. Yue, and J. Lehner, "Traditional Probabilistic Risk Assessment Methods for Digital Systems," NUREG/CR-6962, 2008.
6. M. Yue, L. Cheng, and R. Bari, "Markov Model Applications for Proliferation Resistance and Physical Protection of Advanced Nuclear Systems," Technical Report, Department of Energy Sciences and Technology, Brookhaven National Laboratory, Upton, NY 11973-5000, Sep., 2007
7. M. A. Azarm and M. Yue, "Intermediate Report on the Test Interval Analysis of NSLS Radiological Interlock System," Intermediate Technical Report submitted to National Synchrotron Light Source, Brookhaven National Laboratory, Upton, NY 11973-5000, Dec., 2006
8. M. Yue, L. Cheng, and R. Bari, "Application of Probabilistic Methods to Proliferation Resistance of the ESFR Fuel Cycle Elements," Technical Report, Department of Energy Sciences and Technology, Brookhaven National Laboratory, Upton, NY 11973-5000, Sep., 2006
9. T. L. Chu and M. Yue, "Progress Report on Review of EPRI Technical Basis Document on Treatment of Uncertainty (TR-1009652)," Technical Report submitted to U.S. Nuclear Regulatory Commission, Department of Energy Sciences and Technology, Brookhaven

National Laboratory, Upton, NY 11973-5000,Sep., 2006

10. T. L. Chu, M. Yue, S. Bhargava, G. Martinez-Guridi, and J. Lehner, "Collection of Failure Data and Development of Database for Probabilistic Modeling of Digital Systems," Technical Report submitted to U.S. Nuclear Regulatory Commission, Department of Energy Sciences and Technology, Brookhaven National Laboratory, Upton, NY 11973-5000, August, 2005
11. M. Yue, L. Cheng, and R. Bari, "Application of Probabilistic Methods to Proliferation Resistance: Misuse, Diversion, and Abrogation Scenarios," Technical Report, Department of Energy Sciences and Technology, Brookhaven National Laboratory, Upton, NY 11973-5000, 2005
12. M. Yue, L. Cheng, and R. Bari, "Preliminary Description of Software PRCALC for PR & PP Measure Methodology Evaluation," Technical Report, Department of Energy Science and Technology, Brookhaven National Laboratory, Upton, NY 11973-5000, 2005
13. M. Yue, L. Cheng, and R. Bari, "Application of PRCALC to PR & PP Measure Calculation: Misuse and Diversion Scenario," Technical Report, BNL Milestone Report for Gen IV Work Package, submitted to Department of Energy, 2004
14. M. Yue, M. A. Azarm, and R. Bari, "Algorithm, Modeling, and User's Guide for an Integrated Power System Analysis and Simulation Package: EPTOOL", Technical Report, Department of Energy Sciences and Technology, Brookhaven National Laboratory, Upton, NY 11973-5000, 2004

Presentations and Invited Talks

1. "Detailed Modeling and Integration Study of Grid-Connected Solar PV Generation with Energy Storage and Power-Factor Control Capability," Solar Power International Conference, October, 2011
2. "Definition and Categorization Scheme of BNL Software Failure Modes," Presented in WGRisk DIGREL TG workshop in Washington DC, May, 2011.
3. "Improvement of Advanced Safeguards Design Using A Markov Approach Based Quantitative Assessment," Panel Session "Modeling and Simulation for Enhanced Safeguards" of ANS International Winter Meeting, Washington, DC, Nov., 2007
4. "Safety of Accelerator Facilities: NSLS Interlock Reliability," Presented to National Synchrotron Light Source at Brookhaven National Laboratory, Upton, NY, 2007
5. "Quantitative Assessment of Probabilistic Measures for Proliferation Resistance," American Nuclear Science Winter Meeting, Washington, D. C., Nov., 2005
6. "Development and Application of PR Measure Quantitative Assessment Software," PR & PP Core Group Meeting at Brookhaven National Laboratory, Feb., 2005
7. Quantitative Assessment of Proliferation Resistance for Advanced Light Water Reactor," Experts Group on Proliferation Resistance and Physical Protection of Generation IV Nuclear Energy Systems, Washington DC, Nov., 2004
8. "Multiple Oscillation Stabilizing Control", *2004 Power System Conference & Exposition,* New York, Oct., 2004
9. "Security Assessment and Enhancement of Power Infrastructure," DOE Laboratory Working Meeting on Support to Control System Security and Test Center (CSSTC), Idaho Falls, Aug., 2004
10. "μ-synthesis Power System Stabilizer Design Using a Bifurcation Subsystem Based Methodology," IEEE PES General Meeting, Denver, June, 2004
11. "Bifurcation Subsystem Based Analysis, Synthesis, and Model and Controller Reduction Method for Power Systems", Department of ECE, Illinois Institute of Technology, Chicago, Mar., 2004
12. "BNL Capabilities to Support FERC in Electrical Reliability", Federal Energy Regulatory Commission (FERC), Washington DC, Mar., 2004
13. "Distribution and Transmission Reliability Analysis and Enhancement", The Office of Electric Transmission and Distribution, Department of Energy, Washington DC, Mar., 2004
14. "EPTOOL: A Power System Analysis and Simulation Software Package", The Office of Electric Transmission and Distribution, Department of Energy, Washington DC, Jan., 2004
15. "A Model and Controller Reduction Method for Robust Control Design," North American Power Symposium at University of Missouri, Rolla, Oct., 2003

16. “2003 Blackout: Were We Just Unlucky?” Brookhaven National Laboratory, Oct., 2003
17. “Bifurcation Subsystem Identification,” IEEE PES Summer Meeting in Chicago, July, 2002
18. Bifurcation Subsystem for Saddle-node Bifurcation,” North American Power Symposium at Texas A&M University, Oct., 2001
19. “Bifurcation Subsystem for Hopf Bifurcation,” North American Power Symposium at Texas A&M University, Oct., 2001

Membership and Services

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Member of Defensive Strategies Working Group (DSWG) of the New York State Reliability Council (NYSRC)