



## GREG W. MORTON

### *Chief Technical Officer*



#### **EDUCATION & CERTIFICATIONS**

Master of Science  
Electrical Engineering  
Tennessee Technological  
University (1995)

BSc, Computer Science,  
Tennessee Technological  
University (1992)

BSc, Electrical Engineering  
Tennessee Technological  
University (1992)

Certified LabVIEW Architect

As Chief Technical Officer (CTO) at AMS, **GREG W. MORTON** is responsible for all software and hardware development activities for the company. He directs the AMS software and hardware development departments, supervising a team of 20 engineers, developers, and support personnel. Since joining AMS in 1995, he has been responsible for product developments for use both by AMS and nuclear utilities that have exceeded millions of dollars in commercial revenue. Prior to his CTO role, Mr. Morton served as the AMS software development manager from 1998 to 2016.

A Certified LabVIEW Architect, Mr. Morton has been instrumental in the innovation of several technologies at AMS, which have led to 10 awarded U.S. patents (with 1 patent still pending). He is the author and co-author of numerous technical reports and national industry publications. Mr. Morton has been responsible for managing the development of software products, including software quality assurance protocol, for projects exceeding millions of dollars in commercial revenue.

He has been the principal investigator for several Department of Energy (DOE) Phase II projects including:

- Quantitative Methods for Reliability and Fault Tolerance Testing of Digital Instrumentation and Control
- Advanced Techniques for On-Line Condition Monitoring and Diagnostics of Digital Rod Position Indication Systems for Existing and Next Generation Nuclear Power Plants
- Integrated System for Management of Cable Aging in Nuclear Power Plants

These three projects focused on developing test equipment to monitor and diagnose nuclear power plant systems for surveillance testing or continuous On-Line Monitoring applications.



*Greg W. Morton*

## Patents

### AWARDED

Caylor, S.D., Hashemian, H.M., Morton, G.W., “Non-Intrusive Error Detection Techniques for Control and Shutdown Rod Position in Nuclear Reactors.” Patent No. US 10,446,278 (October 2019)

Caylor, S.D., Morton, G.W., Hashemian, H.M., “In-Situ Determination of Rod Control System Coil and Cable Impedances for Nuclear Power Plants.” Patent No. US 10,395,781 (August 2019).

Shumaker, B.D., Hashemian, H.M., Morton, G.W., Beverly, D.D., Sexton, C.D., “Automated System for On-Line Monitoring and Diagnostics of Rod Position Indication Coils for Nuclear Power Plants.” Patent No. US 9,697,916 (July 2017).

Morton, G.W., Hashemian, H.M., Caylor, S.D., McCulley, J.R., “Systems and Methods of Monitoring Control Rods of a Nuclear Power Plant.” Patent No. US 9,431,137 B2 (August 2016).

Morton, G.W., Hashemian, H.M., Shumaker, B.D., Beverly, D.D., Sexton, C.D., “High Resolution Digital Rod Position Indication System for Nuclear Power Plants.” Patent No. US 8,903,033 B2 (December 2014).

Sexton, C.D., Beverly, D.D., Morton, G.W., Hashemian, H.M., Shumaker, B.D., “Control Rod Position Indication Systems and Methods for Nuclear Power Plants.” Patent No. US 8,824,617 B2 (September 2014).

Hashemian, H.M., Morton, G.W., Shumaker, B.D., Beverly, D.D., Sexton, C.D., “Advanced Digital Control Rod Position Indication System with Rod Drop Monitoring for Nuclear Power Plants.” Patent No. 8,351,561 B2 (January 2013).

Shumaker, B.D., Morton, G.W., Hashemian, H.M., “In-Service Calibration of Temperature Measurement Devices Using Plant Monitoring System Data.” Patent No. 7,739,067 (June 2010).

Morton, G.W., Shumaker, B.D., Hashemian, H.M., “Cross-Calibration of Plant Instruments with Computer Data.” Patent No. 7,295,944 (November 2007).

Morton, G.W., Sexton, C.D., Beverly, D.D., Hashemian, H.M., “Nuclear Reactor Rod Drop Time Testing Method.” Patent No. US 6,404,835 B1 (July 2002).

### PENDING

Hashemian, H.M., Shumaker, B.D., Morton, G.W., “Systems and Methods of Monitoring Operation of Control Rod Mechanisms of Nuclear Power Plants.” Patent Application Publication No. US 2015/625,005 (June 2017).

## National Conference Presentations

Morton, G., Shumaker, B., McCarter, D., Caylor, S., “Reliability and Fault Tolerance Testing of a Nuclear Power Plant Digital Rod Position Indication Coil Diagnostic System.” Proceedings of the American Nuclear Society 11th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), Orlando, FL (February 9–14, 2019).

Goffin, P., Shumaker, B.D., Hashemian, A.H., and Morton, G.M., “On-Line Monitoring for Static and Dynamic Performance Verification of I&C Systems at Sizewell B Nuclear Power Station.” Proceedings of the American Nuclear Society 10th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), San Francisco, CA (June 11–15, 2017).



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**NATIONAL CONFERENCE PRESENTATIONS (cont.)**

Morton, G.W., Shumaker, B.D., McCarter, D.E., Caylor, S.D., Rich, J.T., “Application of Quantitative Methods for Reliability Testing of a Nuclear Power Plant Digital Rod Position Indication Diagnostic System.” American Nuclear Society 10th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), San Francisco, CA (June 11–15, 2017).

Fox, C.M., Gates, J.R., Caylor, S.D., McCarter, D.E., Morton, G.W., Hashemian, H.M., “Online Monitoring of Rod Control Systems in Combustion Engineering Pressurized Water Reactors.” American Nuclear Society 10th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), San Francisco, CA (June 11–15, 2017).

Shumaker, B.D., Morton, G.W., “Development of an Automated Software Reliability Tester for Digital I&C.” American Nuclear Society and Embedded Topical Meeting Nuclear Fuels and Structural Materials, New Orleans, LA (June 12–16, 2016).

Morton, G.W., Shumaker, B.D., Cady, B.H., Hashemian, H.M., “Quantitative Methods for Reliability and Fault Tolerance of Digital Instrumentation and Control Systems.” American Nuclear Society 9th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), Charlotte, NC (February 22–26, 2015).

Caylor, S.D., McConkey, J.B., Morton, G.W., Hashemian, H.M., “On-line Monitoring and Diagnostics for Rod Control Systems in Nuclear Power Plants.” American Nuclear Society 9th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), Charlotte, NC (February 22–26, 2015).

Caylor, S.D., Morton, G.W., McCarter, D.E., Hashemian, H.M., “Online Monitoring of Control Element Drive Mechanism Systems in Pressurized Water Reactors.” American Nuclear Society 9th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), Charlotte, NC (February 22–26, 2015).

Hashemian, H.M., McCulley, J.R., Morton, G.W., Caylor, S.D., “Advanced Fault Monitoring and Diagnostics for Rod Control and Position Systems in Nuclear Reactors.” American Nuclear Society 2013 Annual Meeting, Atlanta, GA (June 16–20, 2013).

Hashemian, H.M., Morton, G.W., Shumaker, B.D., Caylor, S.D., “On-Line Monitoring with Auto-Regressive Modeling in Boiling Water Reactors.” American Nuclear Society 2013 Annual Meeting, Atlanta, GA (June 16–20, 2013).

Hashemian, H.M., Morton, G.W., Caylor, S.D., McCulley, J.R., “On-Line Condition Monitoring and Diagnostics for Rod Control and Rod Position Indication Systems in Nuclear Reactors.” 2012 ANS Winter Meeting and Nuclear Technology Expo, San Diego, CA (November 11–15, 2012).

Shumaker, B.D., Campbell, C.J., Sexton, C.D., Morton, G.W., McConkey, J.B., Hashemian, H.M., “Cable Condition Monitoring for Nuclear Power Plants.” Future of Instrumentation International Workshop (FIIW), Instruments, Sensors and Measurements for Energy Generation, Delivery and Consumption, Gatlinburg, TN (October 8–9, 2012).

Hashemian, H.M., Shumaker, B.D., Morton, G.W., Caylor, S.D., “On-Line Monitoring Implementation in Boiling Water Reactors.” American Nuclear Society 8th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), San Diego, CA (July 22–26, 2012).



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**NATIONAL CONFERENCE PRESENTATIONS (cont.)**

Hashemian, H.M., Morton, G.W., Caylor, S.D., McCulley, J.R., “On-Line Condition Monitoring and Diagnostics for Rod Control and Rod Position Indication Systems in Nuclear Reactors.” American Nuclear Society 8th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), San Diego, CA (July 22–26, 2012).

Hashemian, H.M., Shumaker, B.D., Wunderlich, R.J., Caylor, S.D., and Morton, G.W., “An Integrated System for Static and Dynamic On-Line Monitoring of Nuclear Power Plant Systems and Components.” American Nuclear Society 7th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), held concurrently with the ANS National Meeting, Las Vegas, NV (November 2010).

Hashemian, H.M., Morton, G.W., Caylor, S.D., Shumaker, B.D., “Advanced Digital Rod Position Indication System for Existing and Next Generation Nuclear Reactors.” American Nuclear Society 7th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (NPIC & HMIT), held concurrently with the ANS National Meeting, Las Vegas, NV (November 2010).

Morton, G.W., Hashemian, H.M., Shumaker, B.D., Wunderlich, R.J., “Assessing the Dynamic Performance of Sensors in Nuclear Power Plants Using Low Frequency Plant Computer Data.” 6th American Nuclear Society International Topical Meeting on Nuclear Plant Instrumentation, Controls, and Human–Machine Interface Technologies (NPIC & HMIT), Knoxville, TN (April 5–9, 2009).

Hashemian, H.M., Kiger, C.J., Morton, G.W., Shumaker, B.D., Carter, C., Feltus, M.A., “Wireless Sensor Applications in Nuclear Power Plants.” American Nuclear Society 6th International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human–Machine Interface Technologies (NPIC & HMIT), Knoxville, TN (April 5–9, 2009).

Hashemian, H.M., Morton, G.W., Shumaker, B.D., “Advanced Digital Rod Position Indication System for Existing and Next Generation Nuclear Reactors.” New Nuclear Frontiers 2009 Conference (30th Annual CNS Conference), Calgary, Canada (May 31–June 3, 2009).

Hashemian, H.M., Shumaker, B.D., Morton, G.W., Kiger, C.J., “Wireless Sensors for Equipment and Process Condition Monitoring in Nuclear Power Plants.” 51st Annual ISA POWID Symposium, Scottsdale, AZ (June 2008).

Hashemian, H.M., Shumaker, B.D., Sexton, C.D., Beverly, D.D., Morton, G.W., Riggsbee, E.T., “Neutron Detector Life Extension Through Predictive Maintenance.” 17th Annual Joint ISA POWID/EPRI Controls and Instrumentation Conference, Pittsburgh, PA (June 2007).

Hashemian, H.M., Morton, G.W., “Automated System for Pressure Transmitter Calibration.” 7th International Joint ISA POWID/EPRI Controls and Instrumentation Conference, St. Petersburg, FL (June 1999).

**Publications**

**EPRI REPORTS**

*(Following are publications in which G.W. Morton has directly contributed.)*

Hashemian, H.M. “Implementation of On-Line Monitoring to Extend the Calibration Interval of Pressure Transmitters in Nuclear Power Plants.” EPRI, Palo Alto, CA. 1019188 (December 2009).

Hashemian, H.M., “Implementation Guidelines for Wireless Networks and Wireless Equipment Condition Monitoring.” EPRI Final Report, 1019186 (November 2009).



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Hashemian, H.M., et. al, "Requirements for On-Line Monitoring in Nuclear Power Plants." EPRI, Palo Alto, CA. 1016725 (December 2008).

Hashemian, H.M., "Plant Application of On-Line Monitoring for Calibration Interval Extension of Safety-Related Instruments: Update Report 2008." EPRI, Palo Alto, CA, and British Energy, Suffolk, UK. 1016723 (December 2008).

Hashemian, H.M., et. al., "Plant Application of On-Line Monitoring for Calibration Interval Extension of Safety-Related Instruments: Volume 3: 2007 Update Report." EPRI, Palo Alto, CA, and British Energy, Suffolk, UK. 1015173 (December 2007).

Hashemian, H.M., et. al., "Plant Application of On-Line Monitoring for Calibration Interval Extension of Safety-Related Instruments: Volume 1." EPRI, Palo Alto, CA, and British Energy Group PLC, Suffolk, UK. 1013486 (December 2006).

Hashemian, H.M., et. al., "Plant Application of On-Line Monitoring for Calibration Interval Extension of Safety-Related Instruments: Volume 2." EPRI, Palo Alto, CA, and British Energy Group PLC, Suffolk, UK. 1013486 (December 2006).

Hashemian, H.M., "On-Line Calibration Monitoring of Safety-Related Pressure Transmitters at Watts Bar Unit 1." EPRI Final Report (January 2010).

### **JOURNAL & MAGAZINE ARTICLES**

Shumaker, B.D., Morton, G.W., "Development of an Automated Software Reliability Tester for Digital I&C." *Transactions of the American Nuclear Society*, Vol. 114, pp. 307–309 (June 2016).

Hashemian, H.M., Shumaker, B.D., Morton, G.W., "An Integrated Health Monitoring System for Fission Surface Reactors." *SciVerse Sciences International Forum-2012, Physics Procedia*, Vol. 38, pp. 164–175 (November 2012).

Hashemian, H.M., Kiger, C.J., Morton, G.W., Shumaker, B.D., "Wireless Sensor Applications in Nuclear Power Plants." *Nuclear Technology*, Vol. 173, No. 1, pp. 8–16 (January 2011).

Hashemian, H.M., Morton, G.W., Shumaker, B.D., Kiger, C.J., "Nuclear Power Comeback Sure to Employ Wireless Tools." *InTech Magazine*, an ISA publication (January 2009).