

Matthew J Memmott, PhD

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Education **PhD, Nuclear Science and Engineering, MIT** June 2009
M.S., Nuclear Science & Engineering, MIT February 2007
B.S., Chemical Engineering, BYU April 2005

Experience

Assistant Professor, Chemical Engineering Department (August 2014 to present)
Brigham Young University – Provo, UT

- Tenure track faculty appointment consisting of teaching and mentoring, research, and citizenship service
- Published 6 peer-reviewed journal articles
- Obtained \$800k in externally funded PI awards
- Taught nuclear and chemical engineering courses
- Mentored 5 graduate and 57 undergraduate students as research advisor

Research Positions

Assistant Professor, Chemical Engineering Dept (2014 to present)
Enhanced passive safety systems for light water reactors including integral and standard pressurized water reactors. Also, the development of advanced nuclear power plants such as the molten salt reactor.

Research Scientist, Westinghouse Electric Company (2009 to 2014)
AP1000 reactor system and passive safety design and analysis
Westinghouse SMR lead designer and design concept presenter
Advanced reactor concept analyst and fuel cycle development

Research Assistant, PhD Student, MIT (2005 to 2009)
Dissertation “Thermal-Hydraulic Analysis of Innovative Fuel Configurations for the Sodium Fast Reactor”

Nuclear Engineering Intern, Idaho National Laboratory (2005, 2007)
Idaho National Laboratory – Idaho Falls, Idaho
Created full plant RELAP5 model of ABTR sodium-cooled reactor
Modeled heat transfer of ceramic waste form furnace concept

Other

Experience **Board of Directors, Alpha Tech Research Corp.** (2016 to present)

Awards and Scholarships

BYU Chem. Eng. Dept. “Most Influential Faculty” Award 2019
US DOE NEUP FY 2019 RC-2.1 Grant Award, October 2019 \$798k
US DOE NEUP FY 2019 NE-2.3 Grant Award, October 2019, \$800k
Kairos Power LLC Research Grant Award, December 2018, \$144k
US DOE NEUP FY 2018 NE-2 Grant Award, October 2018, \$800k
US DOE NEUP FY 2018 RC-3 Grant Award, October 2018 \$761k
USTAR, UTAG 2018 Award, State of Utah, July 2017 - \$145k
New Faculty Award, Nuclear Regulatory Commission, July 2016 \$450k
BYU Chem. Eng. Dept. “Outstanding Faculty Teaching” Award, 2015
US DOE Advanced Reactor Concept Award, October 2013 - \$600k
US DOE NEUP FY2012 IRP Award, 2012 - \$600k to Westinghouse
NRC Nuclear Education Fellowship, 2008-2009
DOE Nuclear Engineering/Health Physics Fellowship 2005-2009
Heritage Scholarship, BYU, 1999-2005

Publications and Presentations

11 awarded and pending patents/provisional patents
42 peer-reviewed publication
14 technical presentations

Peer-Reviewed Publications

1. J. Webster, P. Wilding, D. Chipman, M. Memmott, “Suitability of the Kalina Cycle for Power Conversion from Pressurized Water Reactors”, *Energy*, (**under review**)
2. P. R. Wilding, N. R. Murray, M. J Memmott, “The Simultaneous Multi-Objective Optimization of LWR Systems Improves the Design Process of Nuclear Power Plants”, *Nuclear Technology*, (**under review**)
3. J. Webster, M. Memmott, “The Effect of Heat Source Temperatures on the Kalina and Rankine Cycles”, *Applied Energy*, (**under review**)
4. P. R. Wilding, N. R. Murray, M. J Memmott, “Development of a Multi-Objective Optimization Tool for the Design Process of Nuclear Power Plant Systems”, *Annals of Nuclear Energy*, Vol. 137, 107079, March 2020.
5. M. Stoddard, J. Harb, M. Memmott “Numerical Analysis of Isotope Production in Molten Salt Reactors: A Case Study for Molybdenum-99 Production” *Annals of Nuclear Energy*, Vol. 129, pg. 56-61, July 2019.
6. M. Wang, A. Manera, V. Petrov, M. J Memmott, S. Qiu, “Passive Decay Heat Removal System Design for the Integral, Inherently-Safe Light Water Reactor (I²S-LWR)”, *Annals of Nuclear Energy*, 106987, August 2019.

7. M. Wang, A. Manera, M. J Memmott, J. C. Lee, S. Qiu, "Preliminary Design of the I²S-LWR Containment System", *Annals of Nuclear Energy*, **(accepted)**
8. D. O. Lignell, M. J Memmott, A. Anderson, "STEM Outreach to High School Students Through a Chemical Engineering Fluid Mechanics Course Project", *Transactions on Techniques in STEM Education*, Vol. 4, pg 50-59, December 2018.
9. J. Richards, P. Sabharwall, M. J Memmott, "Economic Comparison of Current Electricity Generating Technologies and Advanced Nuclear Options", *The Electricity Journal*, Vol. 30, pg. 73-79, 2017.
10. K. R. McCarroll, J. C. Lee, A. Manera, M. J Memmott, P. Ferroni, "Preliminary Risk Assessment of the Integral Inherently-Safe Light Water Reactor", *Annals of Nuclear Energy*, Vol. 100, pg. 89-102, 2017.
11. A. M. Ward, M. Wang, M. D. Neumann, M. J Memmott, A. Manera, T. J. Downar, "A Simulation of I2S-LWR selected transients", *Annals of Nuclear energy*, 105421, March, 2017.
12. M. J Memmott, P. R. Wilding, B. Petrovic, "An Optimized Power Conversion System Concept of the Integral, Inherently-Safe Light Water Reactor", *Annals of Nuclear Energy*, Vol. 100, pg 42-52, 2017.
13. M. J Memmott, A. Manera, J. Boyack, S. Pacheco, M. Wang, B. Petrovic, "The Primary Reactor Coolant System Concept of the Integral, Inherently-Safe Light Water Reactor", *Annals of Nuclear Energy*, Vol. 100, pg. 53-67, 2017.
14. G. A. Boy, G. Jani, A. Manera, M. Memmott, B. Petrovic, Y. Rayad, L. Stephane, N. Suri, "Improving collaborative work and project management in a nuclear power plant design team: A human-centered design approach", *Annals of Nuclear Energy*. Vol. 94, pg. 555-565, 2016.
15. M. J Memmott, A. Manera "The Use of Flashing Drums and Microchannel Heat Exchangers to Generate Steam in Large Integral Light Water Reactors", *Nuclear Technology*, Vol. 191, 2015.
16. M. Memmott, J. Buongiorno, P. Hejzlar, "An Evaluation of the Annular Fuel and Bottle-shaped Fuel Concepts for Sodium Fast Reactors", *Nuclear Technology*, Vol. 173, 2011.
17. M. Memmott, J. Buongiorno, P. Hejzlar, "On the Use of RELAP5-3D as a subchannel analysis code", *Nuclear Engineering Design*, Vol. 240, pg. 807–815, 2010.

Peer-Reviewed Conference Proceedings and Presentations

1. P. R. Wilding, N. R. Murray, M. J Memmott, "Design Optimization of PERCS in RELAP5 Using Parallel Processing and a Multi-Objective Non-Dominated Sorting Genetic Algorithm", *Transactions of the International Congress on Nuclear Engineering (ICONE 2018)*, London, England, July 22-26, 2018.

2. N. R. Murray, M. E. Sailsbery, S. E. Bischoff, P. R. Wilding, M. J Memmott, “Reactor Core Cooling Performance of a Passive Endothermic Reaction Cooling System During Design and Non-Design Basis Accidents”, Transactions of the International Congress on Nuclear Engineering (ICONE 2018), London, England, July 22-26, 2018.
3. P. R. Wilding, M. J Memmott, “Mixed-Integer Multi-Objective Optimization Applied to the PCS Design of the I2S-LWR”, Transactions of the 2018 ANS Winter Meeting, Washington, DC, USA, October, 2017.
4. *N. Murray, M. Sailsbery, S. Bischoff, M. Memmott*, “Modeling of a Passive Endothermic Reaction Cooling System”, Proceedings of the American Nuclear Society (ANS) Winter Meeting 2016, Las Vegas, NV, USA, November 6-10, 2016.
5. *P. R. Wilding, M. J Memmott*, “Design of the I2S-LWR Steam Generation System using Multivariable Optimization Schemes”, Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP) 2016, San Francisco, CA, USA, April 17-20, 2016.
6. M. J. Memmott, *R. L. Fitzhugh, J. Richards, J. Schaumann*, “Preliminary Design of a Thermal Storage System for use with a Current Light Water Reactor”, Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP) 2016, San Francisco, CA, USA, April 17-20, 2016.
7. *J. R. Johnson, A. Apsley, M. J Memmott*, “Long-Term Nuclear Power Plant Cooling via Passive Endothermic Reaction Cooling Systems (PERCS)”, Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP) 2016, San Francisco, CA, USA, April 17-20, 2016.
8. *J. Richards, R. Fitzhugh, M. Memmott*, “Preliminary Design of a Thermal Storage System for Use with a Current Light Water Reactor”, Proceedings of the American Nuclear Society Winter Meeting 2015, Washington DC, USA, November 8-12, 2015.
9. *P. R. Wilding, M. J Memmott*, “Optimization of Nuclear Steam Generation Systems via Multi-Parameter Sensitivity Analysis”, Proceedings of the American Nuclear Society Winter Meeting 2015, Washington DC, USA, November 8-12, 2015.
10. M. Wang, A. Manera, M. J Memmott, S. Qiu, “Passive Decay Heat Removal System Design for the Integral Inherently Safe Light Water Reactor (I2S-LWR)”, 16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-16), Chicago, IL, USA, August 30 – September 4, 2015.
11. M. Wang, A. Manera, M. J Memmott, J. C. Lee, “Preliminary Design of the I2S-LWR Containment System”, 16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-16), Chicago, IL, USA, August 30 – September 4, 2015.

12. E. Welch, A. Manera, M. J Memmott, P. Ferroni, M. J. Wang, J. Lee, "Preliminary Safety Considerations for the Integral Inherently Safe Light Water Reactor (I2S-LWR), Proceedings of the American Nuclear Society (ANS) Winter Meeting 2014, Anaheim, CA, November 9-13, 2014.
13. Manera, A., Memmott, M.J., "Design and trade-off of the Passive Decay Heat Removal System (DHRS) of the Integral, Inherently Safe Light Water Reactor (I2S-LWR)" Proceedings of the 10th International Conference on the Nuclear Option in Countries with Small and Medium Electricity Grids, Zadar, Croatia, June 1 - 4.
14. M. J Memmott, A. Manera, "The use of a flashing Drum to Generate Steam in the Integral, Inherently Safe Light Water Reactor", Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP), 2014, Charlotte, NC, USA, April 2014.
15. B. Petrovic, M. Marcese, M. J Memmott, "Integral Inherently Safe LWR (I2S-LWR) Concept; Integral Vessel Layout", Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP), 2014, Charlotte, NC, USA, April 2014.
16. T. Allen, E. Blanford, G. Cao, D. Chapin, M. Denman, T. Downar, G. Flanagan, B. Forget, C. Forsberg, E. Greenspan, D. Holcomb, L. W. Hu, S. Majumdar, R. Matzie, M. Memmott, C. Parks, P. Peterson, V Seker, F. Silady, C. Stoots, X. Sun, R. Vollmer, R. Youngblood, A. Cisneros, N. Zweibaum, M. Laufer, R. Scarlat, J. Siefried, "Fluoride-Salt-Cooled, High-Temperature (FHR) Methods and Experiments Program White Paper", UCBTH-12-002, University of California, Berkeley, 5/2013.
17. C. Fiorina, F. Franceschini, M. J Memmott, "Safety Aspects of Thorium Fuel in Sodium-Cooled Fast Reactors", Fast Reactor Conference 2013 (FR13), Paris, France, March 2013.
18. B. Lu, M. J Memmott, A. W. Harkness, "Small Modular Reactor (SMR) Instrumentation & Control (I&C) Functional and Structural Requirements & Considerations", Proceedings of the 8th International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human Machine Interface Technologies (NPIC & HMIT 2012), San Diego, CA, USA, November 2012.
19. G. Garcia, M. J Memmott, "The Westinghouse Small Modular Reactor Design", Proceedings of the 38 Annual Meeting of Spanish Nuclear Society, Caceres, Spain, October 17-19 2012.
20. M. J Memmott, A. W. Harkness, J. Van Wyk, "Westinghouse Small Modular Reactor Nuclear Steam Supply System Design", Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP), 2012, Chicago, IL, USA, July 2012.
21. M. J Memmott, C. Stansbury, C Taylor, "Westinghouse Small Modular Reactor Balance of Plant and Supporting Systems Design", Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP), 2012, Chicago, IL, USA, July 2012.

22. J. Cronje, J. Van Wyk, M. J Memmott “Overview of the Westinghouse Small Modular Reactor Building Layout”, Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP), 2012, Chicago, IL, USA, July 2012.
23. H. Zhang, H. Zhao, C. B. Davis, M. J Memmott, “RELAP5 Analysis of Hybrid Loop-Pool Design for Sodium Cooled Fast Reactors”, Proceedings of 2008 International Congress on Advances in Nuclear Power plants (ICAPP 2008), Anaheim, CA, USA June 8-12, 2008.
24. M. Memmott, J. Buongiorno, P. Hejzlar, “An Assessment of Annular Fuel For Sodium-Cooled Fast Reactors”, Proceedings of 2008 International Congress on Advances in Nuclear Power plants (ICAPP 2008), Anaheim, CA, USA June 8-12, 2008.
25. M. J Memmott, M.J. Driscoll, M.S. Kazimi, and P. Hejzlar, “Hydrogen Production for Steam Electrolysis Using a Supercritical CO₂-Cooled Fast Reactor”, MIT Report MIT-NES-TR-007, February 2007.

Technical Presentations

1. M. J Memmott, “Update on Utah Thorium Energy and Medical Isotopes”, Testimony before the Utah Public Utilities, Energy, and Technology Committee, Utah Capital Building, 7/18/2018. **(Invited)**
2. M. J Memmott, “Update on Utah Thorium Energy and Medical Isotopes”, Testimony before the Utah Public Utilities, Energy, and Technology Committee, Utah Capital Building, 6/20/2018. **(Invited)**
3. M. J Memmott, “Utah Thorium Energy and Medical Isotopes”, Plenary Speaker for March for Science, Park City, UT, 4/14/2018. **(Invited)**
4. M. J Memmott “The Future of Nuclear Power: The challenges and opportunities”, White Mesa Uranium Mill Open House, Blanding, UT, 9/22/2017.**(Invited)**
5. M. J Memmott “Light Water Reactors; Can they be economically competitive today?” Nuclear Futures: Pathways to Innovation: A workshop, 3rd Way, Washington DC, July 11, 2017. **(Invited)**
6. M. J Memmott “Solving the Grand Challenges of Nuclear Energy” Chemical Engineering Graduate Seminar, Brigham Young University 12/1/2016.
7. M. J. Memmott, “Utah Thorium Energy and Medical Isotopes”, Testimony before the Utah Public Utilities, Energy, and Technology Committee, Utah Capital Building, 11/16/2016. **(Invited)**
8. M. J Memmott, C. Oscarson, N. Mason, “Triumphs and Failures in 21st Century European Energy Policy” Café Europa Kennedy Center Panel Discussion, Brigham Young University, 11/16/2016. **(Invited)**
9. M. J Memmott “Utah Thorium Energy and Medical Isotopes”, Presentation at The Governor’s Utah Energy Development Summit 2016, Salt Lake City, UT, May 25, 2016. **(Invited)**
10. M. J Memmott “Nuclear Energy 101 and What Went Wrong at Chernobyl” Nuclear energy and Proliferation in the twenty-first century, Brigham Young University, 3/25/2016. **(Invited)**

11. M. J Memmott, N. Mason, E. Jensen, L. Jevtic-Somlai, M. Simpson, "Atoms for Peace': Lessons for the 21st Century" Panelist for discussion, Brigham Young University, 3/25/2016. **(Invited)**
12. M. J Memmott "Design of an Integral, Inherently Safe Light Water Reactor (I2S-LWR), University of Utah Nuclear Engineering Graduate Student Seminar Speaker, 11/18/2015
13. M. J Memmott, "Update on DOE IRP Project: Integral Inherently Safe Light Water Reactor (I2S-LWR) Panel, 2013 ANS Winter Meeting, 11/12/2013.
14. M. J Memmott "I2S-LWR System Design", Presentation to the I2S-LWR Integrated Reactor Project External Advisory Board, May 31st, Georgia Tech, 2013.

Patents

1. J. Benson, M. Memmott, "Eutectic Salts", Provisional Patent 62/777,595, Filed 12/10/2018.
2. J. Benson, M. Memmott, "Salt Wall in a Molten Salt Reactor", Provisional Patent 62/777,603, Filed 12/10/2018.
3. J. Benson, M. Memmott, "Salt Wall Refabrication, and/or Treatment in a Molten Salt Reactor", Provisional Patent 62/777,612, Filed 12/10/2018.
4. J. Benson, M. Memmott, "Electrochemical Separation Mechanism in a Molten Salt Reactor", Provisional Patent 62/678,235, Filed 5/2018.
5. J. M. Cronje, A. W. Harkness, W. E. Cummins, M. J Memmott, M. C. Smith, "Small Modular Reactor Safety Systems", Patent # US9275761, Issued 3/1/2016.
6. E. J. Lahoda, M. D. Carelli, M. J Memmott, "Optimum Configuration for Fast Reactors", Patent # US8638901, Issued 1/28/2014.
7. pending - U.S. Serial Number 13/495,069, "Combined Core Makeup Tank and Heat Removal System for a Small Modular Pressurized Water Reactor", filed June 13th, 2012.
8. M. J Memmott, J. R. Johnson, "Emergency Heat Removal in a Currently Operating Light Water Reactor Using a Passive Endothermic Reaction Cooling System (PERCS), U. S. Provisional Patent Application, Filed 4/2016.
9. M. J Memmott J. M. Argyle, C. Reidhead, "Containment Dome for Safe Storage, Shipping, and Use of Radioisotopes", U. S. Provisional Patent Application, Filed 5/2016.
10. M. J Memmott, J. M. Argyle, "Personal Food and Water Sanitation Device Using Energetic Photons from Isotope Sources", U. S. Provisional Patent application, Filed 5/2016.

11. M. J Memmott, J. M. Argyle, "Water Sanitation Using Energetic Photons from Isotope Sources", U. S. Provisional Patent application, Filed 5/2016.