

# Kyle R. Gluesenkamp

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## EDUCATION

### PhD, Mechanical Engineering

August, 2007 – November, 2012

University of Maryland, College Park, MD

Dissertation: Development and analysis of micro-polygeneration systems and adsorption chillers

Advisor: Prof. Reinhard Radermacher

### BS, Environmental Science

September, 2000 – June, 2004

University of Oregon, Eugene, OR

Minor: Biology

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## RESEARCH EXPERTISE

- Sorption- and vapor compression-based dehumidification, cooling and heating
- Engines and power generation; combined cooling, heat and power; waste heat utilization; integrated energy systems
- Thermodynamic and transport properties of working fluids
- Building energy efficiency
- Residential appliance energy efficiency
- Experimental design and instrumentation
- Analytical performance evaluation
- Thermodynamic, psychrometric and heat/mass transfer modeling
- Separate sensible and latent cooling

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## RESEARCH EXPERIENCE

### Research & Development Staff

May, 2013 – present

Oak Ridge National Laboratory, Oak Ridge, TN

- Manage and lead projects in cooperative research and development agreements (CRADAs) with major manufacturers (portfolio of over \$2.0M annually)
- Research emphases include:
  - Development of novel concepts for clothes drying – thermoelectric; ultrasonic
  - Development of novel heating, ventilation and air conditioning system concepts
  - Development of electric (CO<sub>2</sub>) and gas-fired heat pump water heaters suitable for the US market
  - Investigation of residential appliance standards
- Successfully pursue funding proposals for energy efficient building equipment R&D in response to federal opportunities (over \$2.1M awarded as lead PI)
- Establish partnerships and subcontracts with private industry and academia

- Published 13 invention disclosures, 21 publications, and delivered 11 invited seminars nationally and internationally

### **Postdoctoral Research Associate**

November, 2012 – May, 2013

Oak Ridge National Laboratory, Oak Ridge, TN

- Led fabrication and development of experimental absorption heat pump water heater
- Managed controls development and design of experiments for transcritical CO<sub>2</sub> heat pump water heater
- Conceived and drafted response to US DOE Funding Opportunity Announcement

### **Consultant**

September 2011 – November, 2012

Optimized Thermal Systems, College Park, MD

- Enable technology selection by developing and interpreting thermodynamic models for Fortune 100 client

### **Graduate Research Assistant**

July 2007 – November, 2012

University of Maryland, College Park, MD

- Conceived, designed, constructed and operated “simulated domestic residence” dynamic test facility to evaluate residential cogeneration and trigeneration systems within scheduling, personnel and budget constraints
- Successfully managed progress and milestones for sponsored projects, directing junior graduate students
- Initiated three invention records, including two with industry partner; coauthor on two more

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## **ADDITIONAL EXPERIENCE**

### **Data and Research Assistant**

January 2007 – June, 2007

American Council On Renewable Energy (ACORE), Washington, DC

### **Congressional Legislative Intern**

September, 2006 – December 2006

Office of Congressman David Wu (First District of Oregon), Washington, DC

### **Volunteer**

April, 2006 – December 2006

Green Empowerment, Portland, OR

### **Field Manager**

March, 2005 – August 2006

Green Mountain Energy Company, Portland, OR

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## **PUBLICATIONS**

### **BOOK CHAPTERS:**

**Gluesenkamp, K.**, Hwang, Y., and Radermacher, R. (2013) ‘Thermally driven heat pumps for use in combined cooling, heating and power’, chapter in Kühn, A., ed. *Handbook of*

*International Energy Agency Annex 34: Thermally Driven Heat Pumps for Heating and Cooling.*

**Gluesenkamp, K.** and Radermacher, R. (2011) 'Heat Activated Cooling Technologies for Small and Micro CHP Applications', chapter in Beith, R., ed. *Small and Micro CHP Systems*, Cambridge, UK: Woodhead Publishing Ltd.

JOURNAL PUBLICATIONS:

Qian, S., **Gluesenkamp, K.**, Hwang, Y., Radermacher, R., Chun, H. (2013) 'Cyclic steady state performance of adsorption chiller with low regeneration temperature zeolite', *Energy*, v. 60, 517-526.

**Gluesenkamp, K.**, Hwang, Y. and Radermacher, R. (2013). 'High efficiency micro trigeneration systems', *Applied Thermal Engineering*, v. 50, 1480-1486.

Spencer J.D., Moton, J., Gibbons, W., **Gluesenkamp, K.**, Ahmed, I., Taverner, A., McGahagan, D., Tesfaye, M., Gupta, C., Bourne, R., Monje, V., Jackson, G. (2013). 'Design of a combined heat, hydrogen, and power plant from university campus waste streams', *International Journal of Hydrogen Energy*, v. 38, 4889-4900.

REFEREED CONFERENCE PUBLICATIONS:

Ayyoub M. Momen, Omar Abdelaziz, **Kyle Gluesenkamp**, Edward Vineyard, Michael Benedict (2014) 'Thermofluid analysis of magnetocaloric refrigeration', in *Proceedings of the ASME International Mechanical Engineering Congress and Exposition*, Montreal, QC, Canada, November 14-20, 2014.

Jiazhen Ling, Yunho Hwang, Vikrant Aute, Reinhard Radermacher, **Kyle Gluesenkamp** (2014) 'Development of a control strategy to maximize system performance of heat pump systems', in *11<sup>th</sup> IEA Heat Pump Conference*, Montreal, QC, Canada, May 12-16, 2014.

Devesh Chugh, **Kyle Gluesenkamp**, Omar Abdelaziz, Saeed Moghaddam (2014) 'A novel absorption cycle for combined water heating, dehumidification, and evaporative cooling', in *International Sorption Heat Pump Conference 2014*, College Park, MD, USA, March 31-April 3, 2014.

Katie Maerzke, George Mozurkewich, Omar Abdelaziz, **Kyle Gluesenkamp**, William Schneider, Doug Morrison, and Edward Maginn (2014) 'Ionic liquid development for absorption heat pump applications', in *International Sorption Heat Pump Conference 2014*, College Park, MD, USA, March 31-April 3, 2014.

Zhiyao Yang, Xin Tang, Ming Qu, Omar Abdelaziz, **Kyle R. Gluesenkamp** (2014) 'Development of an updated ABSorption SIMulation software (ABSIM), in *International Sorption Heat Pump Conference 2014*, College Park, MD, USA, March 31-April 3, 2014.

Suxin Qian, John Hartsog, **Kyle Gluesenkamp**, Yunho Hwang, Reinhard Radermacher (2014) 'Performance of trigeneration systems with adsorption heat pump under various climates', in *International Sorption Heat Pump Conference 2014*, College Park, MD, USA, March 31-April 3, 2014.

- Qian, S., **Gluesenkamp, K.**, Hwang, Y., Radermacher, R. (2013) 'Experimental study on performance of a residential combined cooling, heating and power system under varying building load', in *Proceedings of ASME 2013 7<sup>th</sup> International Conference on Energy Sustainability and 11<sup>th</sup> Fuel Cell Science, Engineering and Technology Conference*, Minneapolis, MN, USA, July 14-19, 2013.
- Gluesenkamp, K.**, Radermacher, R. and Hwang, Y. (2011) 'Trends in absorption machines', in *International Sorption Heat Pump Conference*, Padua, Italy, April 5-7, 2011.
- Gluesenkamp, K.**, Radermacher, R. and Hwang, Y. (2011) 'High efficiency trigeneration systems for buildings', in *European Conference on Polygeneration*, Tarragona, Spain, March 30-April 1, 2011.
- Gluesenkamp, K.**, Horvath, C., Radermacher, R. and Hwang, Y. (2011) 'Air-cooled, single-effect, waste heat-driven water/LiBr absorption system for high ambient temperatures', in *International Sorption Heat Pump Conference*, Padua, Italy, April 5-7, 2011.
- Gluesenkamp, K.**, Radermacher, R. and Hwang, Y. (2011) 'Crystallization inhibitors for water/LiBr absorption chillers', in *International Sorption Heat Pump Conference*, Padua, Italy, April 5-7, 2011.
- Gluesenkamp, K.**, Radermacher, R. and Hwang, Y. (2011) 'Preliminary design of a low regeneration temperature residential adsorption chiller', in *International Sorption Heat Pump Conference*, Padua, Italy, April 5-7, 2011.
- Berry, B., Bowen-Davies, G., **Gluesenkamp, K.**, Kaler, Z., Schmaus, J., Staruk, W., Weiner, E., Woods, B. (2012) 'Design optimization of *Gamera II*: a human powered helicopter', in *68th American Helicopter Society International Forum*, Ft. Worth, TX, USA, May 1-3, 2012.

#### TECHNICAL REPORTS:

- Liu, X., **Gluesenkamp, K.**, Momen, A. (2015). Overview of Resources for Geothermal Absorption Cooling for Buildings. ORNL publication 2015/131. Available at <http://info.ornl.gov/sites/publications/Files/Pub54942.pdf>
- Gluesenkamp, K.** (2014). *Residential clothes dryer performance under timed and automatic termination test procedures*. ORNL publication 2014/431. Available at <http://web.ornl.gov/sci/buildings/docs/2014-10-09-ORNL-DryerFinalReport-TM-2014-431.pdf>
- Horvath, C., **Gluesenkamp, K.**, Hwang, Y., Radermacher, R. (2011). 'Final project report: Comparison of waste heat driven water/LiBr absorption systems and conventional electrically run vapor compression systems for an off-grid, high ambient temperature setting.' Prepared under Sub-award 400036855 under CERDEC Army Power Division Contract No. W909MY-10-C-0003, July 2011.
- Gluesenkamp, K.**, Radermacher, R. and Hwang, Y. (2009). 'Integration of a residential micro CHP system.' September, 2009.

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## INVITED LECTURES, PRESENTATIONS AND WEBINARS

- Gluesenkamp, K.** “US activities, test standards and field tests in gas-fired heat pump water heaters”. Presented to 4<sup>th</sup> *Expert Meeting of the IEA HPP Annex 43*, June 9, 2015, Vienna, Austria.
- Gluesenkamp, K.** “US activities in gas-fired heat pump water heaters”. Presented to 3<sup>rd</sup> *Expert Meeting of the IEA HPP Annex 43*, November 6, 2014, Freiburg, Germany.
- Gluesenkamp, K.** “Gas-fired heat pump water heaters” (Seminar 48, TC8.3 Absorption and Heat Operated Machines). Presented to *ASHRAE Annual Meeting 2014*, July 2, 2014, Seattle, WA.
- Gluesenkamp, K.,** Garrabrant, M., Chapman, G. “Gas heat pumps: an update” Webinar presented to Gas Committee of the Consortium for Energy Efficiency, March 20, 2014.
- Gluesenkamp, K.** “Development of a control strategy with multiple continuous outputs” (Seminar 55, TG1 Optimization). Presented to *ASHRAE Winter Meeting 2013*, January 22, 2013, New York, NY.
- Gluesenkamp, K.,** Abdelaziz, O., Vineyard, E. “Gas-fired absorption heat pump water heater development at Oak Ridge National Laboratory.” Presented to *2013 ACEEE Hot Water Forum*, November 4, 2013, Atlanta, GA.
- Gluesenkamp, K.,** Radermacher, R., Ling, J., Hwang, Y. “Hydrocarbon refrigerants for air conditioning: thermophysical properties and comparisons.” Presented by K. Gluesenkamp to *2012 China Household Electrical Appliances Technical Conference*, October 30, 2012, Nanjing, China.
- Moton, J., Spencer, D., Bourne, R., **Gluesenkamp, K.,** Gibbons, W. “Combined heat, hydrogen and power plant design for the University of Maryland.” Webinar hosted by US Department of Energy, September 4, 2012, Washington, DC, USA.
- Moton, J., Spencer, D., Bourne, R., **Gluesenkamp, K.** “Combined heat, hydrogen and power plant design for the University of Maryland.” Presented to *2012 World Hydrogen Energy Conference*, June 3, 2012, Toronto, Canada.
- Gluesenkamp, K.,** Radermacher, R. “Research on thermally-driven cooling at the CEEE.” Presented by K. Gluesenkamp to *IEA Annex 34 9<sup>th</sup> Expert Meeting*, November 22, 2011, Warwick, UK.
- Radermacher, R., **Gluesenkamp, K.** “Trends in absorption machines.” Keynote session presented by K. Gluesenkamp to *2011 International Sorption Heat Pump Conference*, April 7, 2011, Padua, Italy.
- Gluesenkamp, K.,** Radermacher, R. “Update on CEEE research relevant to IEA Annex 34.” Presented by K. Gluesenkamp to *IEA Annex 34 8<sup>th</sup> Expert Meeting*, April 5, 2011, Padua, Italy.

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## INVENTIONS

- Bansal, P.K., **Gluesenkamp, K.R.**, Bischoff, B.L., Hu, M.Z. (2015). *Membrane assisted heat pump clothes drying*. Oak Ridge National Laboratory Invention Disclosure 2015, DOE S-138,076.
- Gluesenkamp, K.R.**, Abdelaziz, O.A., Momen, A.M. (2015). *Separate sensible and latent cooling using single rotating device with multiple fluids*. Docket Number 201503480 / DOE S-Number S-138,111.
- Gluesenkamp, K.R.**, Bansal, P.B., Radermacher, R., Lee, H., Hwang, Y. (2014). *Multi-mode integrated heat exchanger for separate sensible and latent air conditioning*. Oak Ridge National Laboratory Invention Disclosure 201403447, DOE S-138,076.
- Bischoff, B.L., Hu, M.Z., **Gluesenkamp, K.R.**, Bansal, P.K. (2014). *Membrane system for the reduction of water use in Rankine cycle*. Oak Ridge National Laboratory Invention Disclosure 201403406, DOE S-138,033.
- Bansal, P.K., **Gluesenkamp, K.R.**, Vineyard, E.A. (2014). *Separate sensible and latent cooling system*. Oak Ridge National Laboratory Invention Disclosure 201403373, DOE S-124,997.
- Gluesenkamp, K.R.**, Momen, A.M., Vineyard, E.A. (2014). *Heat pump clothes dryer with thermoelectric drum*. Oak Ridge National Laboratory Invention Disclosure 201403292, DOE S-124,906.
- Momen, A.M., **Gluesenkamp, K.R.**, Vineyard, E.A. (2014). *Clothes dryer using ultrasound phenomena*. Oak Ridge National Laboratory Invention Disclosure 201403266, DOE S-124,877.
- Momen, A.M. and Vineyard, E.A., Abdelaziz, O.A., **Gluesenkamp, K.R.**, (2014). *Thermal storage in primary battery with waste heat recovery for climate control load reduction in BEVs*. Oak Ridge National Laboratory Invention Disclosure 201403272, DOE S-124-883.
- Gluesenkamp, K.R.**, Abdelaziz, O.A. (2013). *Back-to-back rotating heat exchangers for high performance air-to-air heat transfer*. Oak Ridge National Laboratory Invention Disclosure 201303190, DOE S-124,781.
- Momen, A.M., Vineyard, E.A. **Gluesenkamp, K.**, Abdelaziz, O. (2013). *High-efficiency ground-level pumped-hydro electricity storage*. Oak Ridge National Laboratory Invention Disclosure 201303175.
- Momen, A.M., **Gluesenkamp, K.**, Vineyard, E.A. (2013). *Heat storage using phase change material employing magnetic chains of ferrous particles*. Oak Ridge National Laboratory Invention Disclosure 201303162.
- Radermacher, R., **Gluesenkamp, K.**, Hwang, Y., Bush, J. (2012). *Utility cube*. US Patent Application US2012/71478; University of Maryland Invention Disclosure PS-2012-066.
- Gluesenkamp, K.**, Leighton, D., Radermacher, R., Muehlbauer, J., Hwang, Y. (2012). *Differential pressure-based apparatus for high accuracy measurements of small temperature differences*. University of Maryland Invention Disclosure PS-2012-039.

Horvath, C., Leighton, D., **Gluesenkamp, K.**, Al-Abdulkarem, A., Hwang, Y., Radermacher, R. (2012). *Air-cooled absorber design*. University of Maryland Invention Disclosure PS-2012-013.

**Gluesenkamp, K.**, Radermacher, R., Hwang, Y. (2010). *Cascade vapor compression and absorption cycles to achieve building air conditioning at high ambient temperature with air-cooled water/LiBr absorption heat pump*. University of Maryland Invention Disclosure PS-2010-100.

**Gluesenkamp, K.**, Radermacher, R., Hwang, Y. (2010). *Separate sensible and latent cooling for water/LiBr absorption heat pumps with small vapor compression system*. University of Maryland Invention Disclosure PS-2010-099.

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## LEADERSHIP, PROFESSIONAL ACTIVITIES AND AWARDS

**ORNL Significant Event Award**, awarded by ORNL Leadership Team for “significant contribution to ORNL” October, 2014

**Mentor**, Oak Ridge National Laboratory, for one post-masters research associate, as well as numerous graduate and undergraduate interns 2013 – present

**Session Chair**, International Sorption Heat Pump Conference, College Park, MD, USA March, 2014

**Chapter President**, Association of Energy Engineers (AEE), University of Maryland Student Chapter August, 2009 – August, 2012

**Cofounder and Sub-Group Coordinator**, University of Maryland team, winners of 2012 US DOE-sponsored Combined Heat, Hydrogen and Power Student Design Contest November, 2011 – April, 2012

**Journal Article Reviewer** April, 2011 – present  
Applied Thermal Engineering (Elsevier), HVAC&R (ASHRAE), International Journal of Thermal Sciences (Elsevier), Heat and Mass Transfer (Springer)

**Member**, Association of Energy Engineers (AEE) June, 2009 – present

**Member**, American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) May, 2010 – present

**Member**, Society of Automotive Engineers (SAE) February, 2011 – present

**Session Chair**, International Sorption Heat Pump Conference, April, 2011

Padua, Italy

<b><i>Fellowship Recipient</i></b> , US Department of Energy, Office of Fossil Energy Fellowship	2010
<b><i>Scholarship Recipient</i></b> , GDF Suez North America Scholarship	2011; 2008
<b><i>Pilot of world-record human-powered helicopter flight</i></b> , University of Maryland Gamera HPH Team	June 21, 2012
<b><i>Competition Driver and Heat Transfer Engineer</i></b> , drove to 4 <sup>th</sup> place (of 80 teams) in Skidpad event, University of Maryland Formula SAE Team	July 2010 – June 2011

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## SELECTED COURSEWORK

**Energy Conversion Systems:** Energy Systems Analysis, Advanced Energy Audits, Sustainable Energy Production and Utilization, Measurement, Instrumentation and Data Analysis for Thermo-Fluid Processes

**Fundamentals of Mechanical Engineering:** Molecular Thermodynamics, Advanced Fluid Dynamics, Advanced Convection Heat Transfer, Advanced Conduction and Radiation Heat Transfer, Transport Phenomena, Combustion and Reacting Flows

**Applied Engineering:** Engineering Optimization, Engineering Decision Making, Project Performance Measurement

Revised: Sept, 2015