**Joseph D. Rendall**

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# ACADEMIC BACKGROUND

## PhD, Sustainable Energy Systems EngineeringAugust 2019

### Texas A&M University–KingsvilleKingsville, TX

Dissertation: *Thermal stratification in hot water tanks: a review, an empirical fit, a novel model and a prototype diffuser*

Advisor: Dr. William Worek | Co-Advisor: Dr. Kyle Gluesenkamp

## MS and BS, Architectural EngineeringDecember 2012

### University of KansasLawrence, KS

MS thesis: *Thermal performance of passive-solar compartments*

Undergraduate research: *Sustainable architectural designs & eco-labeling of construction materials*

# RESEARCH EXPERIENCE

## Oak Ridge National LaboratoryOak Ridge, TN

### R&D Associate Staff, Multifunctional Equipment Integration Group2022–Present

* Led awarded $2.4 million proposal on heat pump water heating for cold climates for low-income multifamily residences
* Support five projects on heat pump water heaters and thermal energy storage

### Postdoctoral Research Associate, Equipment Research Groups2019–2022

* Submitted seven journal articles as the first author; published five during tenure
* Coauthored eight conference papers
* Led seven invention disclosures on heat transfer and fluid flow
* Submitted two nonprovisional patent applications and four elected disclosures
* Substantially influenced experimentation plans and prototype designs
* Coauthored three final project reports

### PhD HERE Intern, ORISE, ORAU, Building Equipment Group2018–2019

* Prepared three manuscripts for journal submission
* Created an experimental apparatus for fluid and heat transfer data collection
* Disclosed one invention

## National Science FoundationKingsville, TX

### Graduate Assistant, Research Experiences for UndergraduatesSummer 2016 and 2017

* Guided students to three awards—two for presentations and one for a conference paper
* Published two conference papers

## University of KansasLawrence, KS

### Graduate Research Assistant2010–2012

* Developed one conference presentation
* Created a 100+ channel solar-thermal field experimental setup
* Processed two years of experimental data

### Undergraduate Research Assistant2008–2009

* Produced one industry article

# PUBLICATIONS

## Journal Articles

Gao, Z., **Rendall, J.**, Abuheiba, A., Nawaz, K., and Abdelaziz, O., “Modeling and Simulation of Membrane-Based Dehumidification and Energy Recovery,” submitted to *International Journal of Heat and Mass Transfer*, 2022.

Munk, J., Hunt, W., Gehl, T., and **Rendall, J.**, “Field Performance of R-1234yf Heat Pump Water Heaters,” submitted to *Applied Thermal Energy*, 2022.

**Rendall, J.**, Elatar, A., and Nawaz, K., “A comprehensive review: phase change materials for system integration and optimization in domestic heat pump water heaters,” submitted to *Renewable and Sustainable Energy Reviews*, 2022.

**Rendall, J.**, Turnaoglu, T., and Patel, V. K., “Experimental Results of a Magnetically Coupled Piezoelectric Actuator to Relieve Microchannel Heat Exchanger Maldistribution,” *International Communications in Heat and Mass Transfer* 133, 105944, 2022.

**Rendall, J.**, Nawaz, K., Elatar, A., Asher, W., and Worek, W., “Performance evaluation of a wrapped around condenser for heat pump water heater applications,” *Applied Thermal Energy* 207, 118097, 2022.

**Rendall, J.**, Abuheiba, A., Gluesenkamp, K., Nawaz, K., Worek, W., and Elatar, A., “Nondimensional convection numbers modeling thermally stratified storage tanks: Richardson’s number and hot-water tanks,” *Renewable and Sustainable Energy Reviews* 150, 111471, 2021.

**Rendall, J.**, Karg-Bulnes, F., Gluesenkamp, K., Abuheiba, A., Worek, W., and Nawaz, K., “A flow-rate dependent 1D model for thermally stratified hot-water energy storage,” *Energies* 14(9), 2661, 2021.

**Rendall, J.**, Gluesenkamp, K., Abuheiba, A., Nawaz, K., Worek, W., and Gehl, T., “Empirical Characterization of Vertical-tube Inlets in Hot-water Storage Tanks,” *International Communications in Heat and Mass Transfer* 119, 104838, 2020.

## Conference Papers

**Rendall, J.**, Asher, W., Brechtl, J., Li, K., Yang C., Sun, J., and Nawaz K., “Experimental Results of Density Controlled Phase Change Material Capsules for Increased First Hour Rating for Heat Pump Water Heaters,” submitted to *Herrick Conferences*, 2022,

Kowalski, K., **Rendall, J.**, Abuheiba, A., Cheekatamarla P., and Momen, A., “Initial Design and Experimental Results of a Novel Near-Isothermal Compressor for Heat Pump Applications,” *Herrick Conferences*, 2022.

Sun, J., Nawaz, K., **Rendall, J.**, Brechtl, J., and Elatar, A., “Model-based Co-Simulation of Heat Pump Water Heater with Embedded Phase Change Materials Thermal Energy Storage,” *Herrick Conferences*, 2022.

Nawaz, K., **Rendall, J.**, Elatar, A., and Sun, J., “Propane as working fluid for heat pump water heaters – opportunities and challenges,” *Herrick Conferences*, 2022.

Kumar, N., **Rendall, J.**, Turnaoglu, T., Gluesenkamp, K., Patel, V., Abuheiba, A., and Gehl, T., “Experimental measurements of evaporation and condensation mass transfer resistances for surfaces in dishwashers,” *Herrick Conferences*, 2021.

Gluesenkamp, K., Kumar, N., **Rendall, J.**, Patel, V., Gehl, T., Abuheiba, A., Turnaoglu, T., and Wu, G., “Novel dishwasher with thermal storage and thermoelectric heat recovery,” *Herrick Conferences*, 2021.

Karg, F. B., Gluesenkamp, K., and **Rendall, J.**, “Comparison of plug flow and multimode stratified tank modeling approached regarding computational efficiency and accuracy,” *IMECE*, 2020.

Chin, S., **Rendall, J.**, Liu, X., and Shen, H., “The effect of fenestration system on building energy and daylighting performance – An experimental study in humid subtropical climate,” *ASHRAE*, 2018.

Ferster, B., Shen, H., and **Rendall, J.**, “Optimization modeling for passive cooling in South-Texas,” *Building Simulation*, 2017.

**Rendall, J.**, and Chong, O., “A proposed eco-labeling method for building design,” *ASCE*, 2009.

**DOE Final Reports**

**Rendall, J.**, Abuheiba A., and Gao, Z., “Final Report: Membrane-Based Air Conditioning System,” 2022.

Zhang, M., **Rendall, J.**, Nawaz, K., Patel, K., Murphy, B., and Momen, A., “Final Report – Novel Solid-State Thermo-Magneto Generator Utilizing Low-Temperature Geothermal Fluid Resources,” 2021.

Abuheiba, A., Momen, A., Zhang, M., **Rendall, J.**, Barcza, A., and Vieyra, H., “BENEFIT FOA FY2015 – Solid State Magnetocaloric Air Conditioner – Final Report,” 2020.

## Book Chapters

Kunkel, K., Wuebbles, D., **Rendall, J.**, et al. “Climate Change”, *2021* *ASHRAE Handbook-Fundamentals,* ASHRAE, 2021.

# PATENTS

Majority inventor, Propane Heat Pump Water Heater with Modified Condenser (elected disclosure)2022

Majority inventor, Pressure Sensor for State of Charge Determination in Phase Change Materials (elected disclosure) 2022

Majority inventor, Density Controlled Phase Change Capsules (approved for nonprovisional) 2022

Majority inventor, Piezoelectric Driven Magnetic Actuator (elected disclosure) 2022

Majority inventor, “Hydraulically Opened Cone Vertical Tube Diffuser with Slanted Anti‑Siphon Hole” (nonprovisional filed)2021

Majority inventor, “The Linear Magnet Pump with Self-Healing Seal” (provisional) 2018

# LEADERSHIP EXPERIENCE

## ASHRAE

### Voting Member, Climate Change TC 2.052019–Present

### Member, Student President, Student Vice President2009–2019

### Student Vice President2011

### Student President2010

## ASME

### Member2016–Present

## ADS PhD Student Group, Texas A&M University–Kingsville

### Secretary2016–2017

## Engineers Without Borders

### Traveling Mentor, Construction Lead2012–2017

## Teachers’ Change-maker, STiR Education

### Associate Member2015

## Sparks Student Group, National Teachers’ College Kaliro

### Mentor2014

## Leader Shape Winter Conference

### Attendee2011

## Toastmasters International

### Member2010

# SPECIALIZED TRAINING

## DOE IMPEL+ Training, Lawrence Berkeley National LaboratoryVirtual

### IMPEL+ Innovator8 hours, 2020

## Oak Ridge National LaboratoryOak Ridge, TN

### Inventor-Corps Lite9 hours, 2019

### CFD Essentials by Chris Greenshields40 hours, 2019

## Texas A&M University–KingsvilleKingsville, TX

### Culturally Aware Teaching12 hours, 2017

### Teaching Development10 hours, 2017

## Peace Corps UgandaKaliro, Uganda

### Lusoga Language240 hours, 2015

### Teaching Boot Camp160 hours, 2013

## Belgium Development AgencyKaliro, Uganda

### Active Teaching and Learning120 hours, 2014

# SOFTWARE/HARDWARE SKILLS

* COMSOL Multiphysics (proficient)
* OpenFOAM (basic)
* LabVIEW (proficient)
* NI CDAQ (proficient)
* MATLAB (proficient)
* Camtasia (basic)
* Benchlink Data Acquisition (proficient)
* AutoCAD (basic)
* REVIT MEP (basic)
* Microsoft PowerPoint/Excel/Word (well practiced)

# SCHOLARSHIPS, AWARDS, FELLOWSHIPS, AND CERTIFICATIONS

Higher Education Research Experiences, ORAU/ORISE, Building Technologies Research and Integration Center at Oak Ridge National Laboratory (~$100,000)2018–2019

Doctoral Student Support, Texas A&M University–Kingsville ($3,000 per year)2016–2019

All Star in Research, Texas A&M University–Kingsville (awarded)2018

Excellence in Teaching Award, Texas A&M University–Kingsville (nominated)2017

Hoglund Scholarship, University of Kansas ($3,000)2012–2013

Steves Memorial Scholarship, University of Kansas ($2,500)2012

Ruben Zadigan Scholarship, University of Kansas ($1,500)2011

Robinson Fellowship, University of Kansas ($1500)2010

Bradshaw Graduate Scholarship, University of Kansas ($1500)2010

Engineering in Training Certification, State of Kansas (certification)2010

Undergraduate Research Award, University of Kansas ($500)2009