

# KODY M. POWELL, PH.D.

Salt Lake City, UT | kody.powell@utah.edu | kodypowell.che.utah.edu | 801-581-3957

## WORK EXPERIENCE

---

<b>The University of Utah Department of Chemical Engineering, SLC, UT</b> <b>Assistant Professor</b>	2016-Present
---	--------------

Research in energy systems with a specialty in process modeling, optimization, advanced control, and energy storage

Courses Taught:

Heat Transfer (Fall 2016, Fall 2017, Fall 2018)

Fundamentals of Smart Systems (Spring 2017, Spring 2018, Spring 2019)

---

<b>The University of Utah Department of Mechanical Engineering, SLC, UT</b> <b>Adjunct Assistant Professor</b>	2016-Present
---	--------------

Research in energy systems and energy efficiency

---

<b>ExxonMobil Research and Engineering, The Woodlands, TX</b> <b>Real-Time Optimization Research and Development Engineer</b>	2013-2016
--	-----------

Real-time optimization development and global support for refining and chemical plant utility networks, first principles process modeling and estimation for fault detection, model predictive control, real-time optimization, and distributed control system development for refinery-wide utilities, gasoline blending, environmental

---

<b>The University of Texas at Austin – Utilities and Energy Management</b> <b>Project Leader for Large-Scale Utilities Optimization Project</b>	2012 – 2013
--	-------------

Dynamic real-time optimization of campus-wide utilities (electricity heating, and cooling), energy demand forecasting, model development for gas and steam turbines, waste heat boilers, centrifugal chillers, cooling towers, energy storage system

## EDUCATION

---

<b>Ph.D. in Chemical Engineering</b>	2013
--------------------------------------	------

The University of Texas at Austin, Austin, TX

Dissertation: “Dynamic Optimization of Energy Systems with Thermal Energy Storage”

National Science Foundation Graduate Research Program Fellow

Cockrell School of Engineering Graduate Research Fellow

---

<b>B.S. in Chemical Engineering, Chemistry Minor</b>	2009
--	------

The University of Utah, Salt Lake City, UT

Magna Cum Laude

Oblad Silver Medal of Excellence

American Institute of Chemical Engineers Outstanding Senior

University of Utah Presidential Scholarship

## AWARDS

---

<b>Patriot Award</b> – Employer Support of the Guard and Reserve	2019
<b>Excellence in Applied Energy Engineering Research</b> – U.S. Department of Energy	2018
<b>Outstanding Faculty in Chemical Engineering</b> – AIChE Student Chapter	2018
<b>Top 10% Rated Graduate Instructor</b> – U. of Utah College of Engineering	2018
<b>Top 10% Rated Undergraduate Instructor</b> – U. of Utah College of Engineering	2017
<b>Excellence in Applied Energy Engineering Research</b> – U.S. Department of Energy	2017
<b>Faculty Career Champion Award</b> – University of Utah Career Services	2017
<b>Top 10% Rated Graduate Instructor</b> – U. of Utah, College of Engineering	2017
<b>Graduate Research Fellow</b> – National Science Foundation	2009-2013
<b>Graduate Research Fellow</b> – Cockrell School of Engineering	2009-2013

## COMMITTEE APPOINTMENTS AND SERVICE ASSIGNMENTS

---

<b>Member</b> Department of Chemical Engineering Faculty Search Committee	2018-2019
<b>Student Career Advisor</b> Department of Chemical Engineering Service Assignment	2016-Present
<b>University Studies Committee Member</b> University of Utah University Studies Committee	2016-Present
<b>Webinar Series Associate Editor</b> American Institute of Chemical Engineers Webinar Series	2016-Present
<b>University Graduate Fellowship Evaluation Committee Member</b> University of Utah Graduate Fellowship Committee	2016
<b>Member</b> Computers and Systems Technology (CAST) Division of AIChE	2010-Present
<b>Member</b> American Institute of Chemical Engineers	2006-Present

## PEER-REVIEWED PUBLICATIONS

---

“An economic and policy case for proactive home energy management systems with photovoltaics and batteries” M. Sheha, <b>K.M. Powell</b> <i>The Electricity Journal</i> , Volume 32, Issue 1, pp. 6-12	2019
“Dynamic optimization of a district energy system with storage using a novel mixed-integer quadratic programming algorithm” L. Blackburn, A. Young, W.P. Rogers, J.D. Hedengren, <b>K.M. Powell</b> <i>Optimization and Engineering</i> , pp. 1-29	2019

“Dynamic simulation, control, and performance evaluation of a synergistic solar and natural gas hybrid power plant”

K. Rashid, S.M. Safdarnejad, **K.M. Powell**

*Energy Conversion and Management*, Volume 179, pp. 270-285 2019

“Leveraging Energy Storage in a Solar-Tower and Combined Cycle Hybrid Plant”

K. Ellingwood, S.M. Safdarnejad, K. Rashid, **K.M. Powell**

*Energies*, Volume 12, Issue 40 2019

“Proactive automation of a batch manufacturer in a smart grid environment”

B. Westberg, D. Machalek, S. Denton, D. Sellers, **K.M. Powell**

*Smart and Sustainable Manufacturing Systems*, Volume 2, pp. 1-23 2018

“Performance comparison of low temperature and chemical absorption carbon capture processes in response to dynamic electricity demand and price profiles”

S.M. Safdarnejad, J.D. Hedengren, **K.M. Powell**

*Applied Energy*, Volume 228, pp. 577-592 2018

“Dynamic real-time optimization of air conditioning systems in residential houses under different electricity pricing structures”

M.N. Sheha, K. Rashid, **K.M. Powell**

*Proceedings of the American Control Conference*, 2018, pp. 5356-5361 2018

“Real-time optimization of a solar-natural gas hybrid power plant to enhance solar power utilization”

K. Rashid, M.N. Sheha, **K.M. Powell**

*Proceedings of the American Control Conference*, 2018, pp. 3002-3007 2018

“Dynamic real-time optimization of air-conditioning systems in residential houses with battery energy storage under different electricity pricing structures”

M.N. Sheha, **K.M. Powell**

*Computer Aided Chemical Engineering* Volume 44, pp. 2527-2532 2018

“Hybrid concentrated solar thermal power systems: a review”

**K.M. Powell**, K. Rashid, K. Ellingwood, J. Tuttle, B.D. Iverson

*Renewable and Sustainable Energy Reviews*, Volume 80, pp. 215-237 2017

“Optimal combined long-term facility design and short-term operational strategy for CHP capacity investments”

J.L. Mojica, D. Petersen, B. Hansen, **K.M. Powell**, J.D. Hedengren

*Energy*, Volume 118, pp. 97-115 2017

“Thermal energy storage to minimize cost and improve efficiency of a polygeneration district energy system in a real-time electricity market”

**K.M. Powell**, J.S. Kim, W. Cole, K. Kapoor, J. Mojica, J.D. Hedengren, T.F. Edgar

*Energy*, Volume 113, pp. 52-63 2016

“A continuous formulation for logical decisions in differential algebraic systems using mathematical programs with complementarity constraints”

**K.M. Powell**, A.N. Eaton, J.D. Hedengren, T.F. Edgar

*Processes*, Volume 4, Issue 1 2016

- "Energy intensification using thermal storage"  
T.F. Edgar, **K.M. Powell**  
*Current Opinion in Chemical Engineering*, Volume 9, pp. 83-88 2015
- "Nonlinear modeling, estimation and predictive control in APMonitor"  
J.D. Hedengren, R.A. Shishavan, **K.M. Powell**, T.F. Edgar  
*Computers & Chemical Engineering*, Volume 70, pp. 133-148 2014
- "Heating, cooling, and electrical load forecasting for a large-scale district energy system"  
**K.M. Powell**, A. Sriprasad, W.J. Cole, T.F. Edgar  
*Energy*, Volume 74, pp. 877-885 2014
- "Dynamic optimization of a hybrid solar thermal and fossil fuel system"  
**K.M. Powell**, J.D. Hedengren, T.F. Edgar  
*Solar Energy*, Volume 108, pp. 210-218 2014
- "Reduced-order residential home modeling for model predictive control"  
W.J. Cole, **K.M. Powell**, E.T. Hale, T.F. Edgar  
*Energy and Buildings*, Volume 74, pp. 69-77 2014
- "Turbine inlet cooling with thermal energy storage"  
W.J. Cole, J.D. Rhodes, **K.M. Powell**, E.T. Hale, T.F. Edgar  
*International Journal of Energy Research*, Volume 38, pp. 151-161 2014
- "An adaptive-grid model for dynamic simulation of thermocline energy storage systems"  
**K.M. Powell**, T.F. Edgar  
*Energy Conversion and Management*, Volume 76, pp. 865-873 2013
- "Optimal chiller loading in a district cooling system with thermal energy storage"  
**K.M. Powell**, W.J. Cole, U.F. Ekarika, T.F. Edgar  
*Energy*, Volume 50, pp. 445-453 2013
- "Improved large-scale process cooling operation through energy optimization"  
K. Kapoor, **K.M. Powell**, W.J. Cole, J.S. Kim, T.F. Edgar  
*Processes*, Volume 1, pp. 312-329 2013
- "Dynamic optimization of a campus cooling system with thermal storage"  
**K.M. Powell**, W.J. Cole, U.F. Ekarika, T.F. Edgar  
*Proceedings of the European Control Conference*, 2013, pp. 4077-4082 2013
- "Nonlinear model predictive control for a heavy-duty gas turbine power plant"  
J.S. Kim, **K.M. Powell**, T.F. Edgar  
*Proceedings of the American Control Conference*, 2013, pp. 2952-2957 2013
- "Dynamic optimization of a solar thermal energy storage system over a 24 hour period using weather forecasts"  
**K.M. Powell**, J.D. Hedengren, T.F. Edgar  
*Proceedings of the American Control Conference*, 2013, pp. 2946-2951 2013
- "Modeling and control of a solar thermal power plant with thermal energy storage"  
**K.M. Powell**, T.F. Edgar  
*Chemical Engineering Science*, Volume 71, pp. 138-145 2012

- “Optimization and advanced control of thermal energy storage systems”  
W.J. Cole, **K.M. Powell**, T.F. Edgar  
*Reviews in Chemical Engineering*, Volume 28, pp. 81-99 2012
- “Control of a large scale solar thermal energy storage system”  
**K.M. Powell**, T.F. Edgar  
*Proceedings of the American Control Conference, 2011*, pp. 1530-1535 2011

#### CONFERENCE PRESENTATIONS

---

- “A Novel Dynamic Simulation Methodology for High Temperature Packed-Bed Thermal Energy Storage”  
J.F. Tuttle, N. White, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, Pittsburgh, PA, Nov. 2018 2018
- “Application of a Data-Driven Modeling Approach to a Large-Scale Power Plant”  
S.M. Safdarnejad, J.F. Tuttle, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, Pittsburgh, PA, Nov. 2018 2018
- “Dynamic Real-Time Optimization of a Coal-Fired Power Plant Using an Artificial Neural Network Model”  
J.F. Tuttle, S.M. Safdarnejad, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, Pittsburgh, PA, Nov. 2018 2018
- “Analysis of a Thermal Generator’s Participation in the Western Energy Imbalance Market and the Resulting Effects on Overall Performance and Emissions”  
J.F. Tuttle, W.J. Cole, **K.M. Powell**  
Energy Policy Research Conference, Boise, ID, Sept. 2018 2018
- “An Economic and Policy Case for Proactive Home Energy Management Systems with Photovoltaics and Batteries”  
M.N. Sheha, **K.M. Powell**  
Energy Policy Research Conference, Boise, ID, Sept. 2018 2018
- “Dynamic Real-Time Optimization of Air Conditioning Systems in Residential Houses under Different Electricity Pricing Structures”  
M.N. Sheha, K. Rashid, **K.M. Powell**  
American Control Conference, Milwaukee, WI, June 2018 2018
- “Real-Time Optimization of a Solar-Natural Gas Hybrid Power Plant to Enhance Solar Power Utilization”  
K. Rashid, M.N. Sheha, **K.M. Powell**  
American Control Conference, Milwaukee, WI, June 2018 2018
- “Dynamic Real-Time Optimization of Air Conditioning Systems in Residential Houses with Battery Energy Storage under Different Electricity Pricing Structures”  
M.N. Sheha, **K.M. Powell**  
Process Systems Engineering Conference, San Diego, CA, July 2018 2018
- “Maximizing the Output of a Solar and Natural Gas Hybrid Power Plant Using Real-Time Optimization”  
K. Rashid, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, Minneapolis, MN, Nov. 2017 2017
- “Design and Dynamic Simulation of a Solar and Natural Gas Hybrid Power Plant to Investigate the Synergies of Hybridization”  
K. Rashid, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, Minneapolis, MN, Nov. 2017 2017

“Leveraging Storage and Hybridization to Maximize Renewable Utilization”

K. Ellingwood, J.F. Tuttle, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2016 2016

“Maximization of Energy Efficiency of a Combined Heat and Power Plant”

T.F. Edgar, **K.M. Powell**, J.S. Kim, K. Kapoor

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2013 2013

“Nonlinear Model Predictive Control for a Heavy-Duty Gas Turbine Power Plant”

J.S. Kim, **K.M. Powell**, T.F. Edgar

American Control Conference, Washington, DC, June 2013 2013

“Dynamic Optimization of a Campus Cooling System with Thermal Storage”

**K.M. Powell**, W.J. Cole, U.F. Ekarika, T.F. Edgar

European Control Conference, Zurich, Switzerland, July 2013 2013

“Dynamic Optimization of a Solar Thermal Energy Storage System over a 24-Hour Period Using Weather Forecasts”

**K.M. Powell**, J.D. Hedengren, T.F. Edgar

American Control Conference, Washington, DC, June 2013 2013

“Dynamic Optimization of Solar Thermal Systems with Storage”

**K.M. Powell**, J.D. Hedengren, T.F. Edgar

American Institute of Chemical Engineers Annual Conference, Pittsburgh, PA, Oct. 2012 2012

“A Process Systems Approach to Teaching Distillation”

**K.M. Powell**, T.F. Edgar

American Institute of Chemical Engineers Annual Conference, Pittsburgh, PA, Oct. 2012 2012

“Control of a Large-Scale Solar Thermal Energy Storage System”

**K.M. Powell**, T.F. Edgar

American Control Conference, San Francisco, CA, June 2011 2011

## INVITED PRESENTATIONS, WORKSHOPS, AND CHAIRED SESSIONS

---

“Design and Performance Evaluation of Solar Thermal and Natural Gas Hybrid Power Plants”

**K.M. Powell**

Boise State University Department of Mechanical Engineering

Graduate Research Seminar, Boise, ID, Sept. 2018 2018

“An Overview of DOE’s 50001 Ready Energy Management Program”

J. Sieving, **K.M. Powell**

Given in Conjunction with Utah Clean Energy and the Utah Governor’s Office of Energy Development

Professional Workshop for Energy Managers, Salt Lake City, UT, Aug. 2018 2018

“The Faculty Champion’s Initiative: Why it Works”

K. Dries, **K.M. Powell**

The Career Leadership Collective

Professional Workshop for University Career Representatives, Webinar, Aug. 2018 2018

“Optimization and the Smart Grid”

**K.M. Powell**

Session Chair

The American Control Conference, Milwaukee, WI, June 2018 2018

**“Synergistic Solar Hybrids”****K.M. Powell**Brigham Young University Department of Chemical Engineering  
Graduate Research Seminar, Provo, UT, Nov. 2017

2017

**“Advancing Energy Efficiency in Manufacturing”****K.M. Powell**Energy Services Coalition Workshop – Utah Chapter  
Energy Services Coalition – Utah Chapter, Salt Lake City, UT, Nov. 2017

2017

**“Design and Operation of Synergistic Solar Hybrids”****K.M. Powell**University of Utah Department of Chemical Engineering  
Graduate Research Seminar, Salt Lake City, UT, Oct. 2017

2017

**“A Career in the Energy Sector”****K.M. Powell**Given to Students and Energy Professionals  
Utah Energy Career Expo, Salt Lake City, UT, June 2017

2017

**“Dynamic Optimization of Energy Systems with Energy Storage”****K.M. Powell**Brigham Young University Department of Chemical Engineering  
Graduate Research Seminar, Provo, UT, Oct. 2016

2016

**“Hybrid Systems, Optimization, and Energy Storage”****K.M. Powell**Idaho National Laboratory  
Nuclear Hybrid Energy Systems CORE Workshop, Idaho Falls, ID, June 2013

2013

**RESEARCH GRANTS**Department of Energy: Office of Energy Efficiency and Renewable Energy, “Machine-Learning-Based Optimization of Industrial Cooling Towers” 2018-2019, J. Sieving (PI), Kody Powell (co-PI), **\$25,000**.Utah Governor’s Office of Energy Development, “Smart Energy Management in Industrial Systems”, 2018-2019, K.M. Powell (PI), **\$25,000**.Utah Science and Technology Research (USTAR): Energy Research Triangle, “Proactive Energy Management using Weather and Market Forecasts to Enhance Efficiency and Renewables on the Grid”, 2017-2022, K.M. Powell (PI), J.D. Hedengren (co-PI), S. Clyde (co-PI), **\$125,000**.Department of Energy: Office of Energy Efficiency and Renewable Energy, “Proactive Automation of Batch Manufacturing in a Smart Grid Environment” 2017-2018, K.M. Powell (PI), Stephen Denton (co-PI), Helga Kovacs (co-PI), **\$25,000**.PacifiCorp: Sustainable Transportation and Energy Plan (STEP), “Artificial Intelligence to Enhance Clean Coal”, 2017-2019, K.M. Powell (PI), **\$395,000**.Utah Governor’s Office of Energy Development, “Smart Energy Management in Industrial Systems”, 2017-2018, K.M. Powell (PI), **\$90,000**.Department of Energy Office of Energy Efficiency and Renewable Energy, “Intermountain Industrial Assessment Center”, 2016-2021, K.M. Powell (PI), A. Smith (co-PI), K. Whitty (co-PI), **\$1,805,161**.

The University of Texas at Austin Office of Sustainability, "Optimization of the Campus Cooling System to Reduce Energy Usage", 2012-2013, K. M. Powell (PI), T. F. Edgar, K. Kurelich, W. J. Cole, R. Thompson, J. Hedengren, K. Kapoor, J. Mojica, A. Sriprasad, J. Kim (co-PI's), **\$36,930**.

National Science Foundation Graduate Research Fellowship Program, "Measurement Techniques and Improved Control Systems for Rapid Thermal Annealing Processes Used for Printed Thin Film Solar Cells", 2009-2012, K.M. Powell (PI), **\$121,500**.