

# KODY M. POWELL, PH.D.

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## WORK EXPERIENCE

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**The University of Utah Department of Chemical Engineering, SLC, UT** 2016-Present  
**Assistant Professor**

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

**The University of Utah Department of Mechanical Engineering, SLC, UT** 2016-Present  
**Adjunct Assistant Professor**

Research in energy systems and energy efficiency

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**ExxonMobil Research and Engineering, The Woodlands, TX** 2013-2016  
**Real-Time Optimization Research and Development Engineer**

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

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

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

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**Ph.D. in Chemical Engineering** 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.S. in Chemical Engineering, Chemistry Minor** 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

## TEACHING

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<b>Fundamentals of Heat Transfer</b>	2016-Present
<b>Fundamentals of Smart Systems</b>	2017-Present
<b>Cooperative Education</b>	2020-Present

## AWARDS

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<b>IAC Center of Excellence</b> – U.S. Department of Energy – Advanced Mfg. Office	2020
<b>2020 Young Investigator of the Year Award</b> – <i>Processes Journal</i>	2020
<b>Excellence in Applied Energy Engineering Research</b> – U.S. Department of Energy	2020
<b>Faculty Career Champion Award</b> – University of Utah Career Center	2020
<b>Patriot Award</b> – Employer Support of the Guard and Reserve	2019
<b>Outstanding Faculty in Chemical Engineering</b> – AIChE Student Chapter	2019
<b>Top 10% Rated Graduate Instructor</b> – U. of Utah College of Engineering	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 Center	2017
<b>Top 10% Rated Graduate Instructor</b> – U. of Utah, College of Engineering	2017
<b>Graduate Research Fellowship Program (GRFP)</b> – National Science Foundation	2009-2012
<b>Graduate Research Fellow</b> – Cockrell School of Engineering	2009-2013

## PEER-REVIEWED PUBLICATIONS

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“Techno-economic analysis of the impact of dynamic electricity prices on solar penetration in a smart grid environment with distributed energy storage” M. Sheha, K. Mohammadi, <b>K.M. Powell</b> <i>Applied Energy</i> , Volume 282, 116168	2021
“Geographical impact on solar utility and levelized cost in flexible hybrid CSP plants” K. Ellingwood, <b>K.M. Powell</b> <i>Proceedings of the 26<sup>th</sup> SolarPACES International Conference</i>	In Press
“Proposal and assessment of a novel multigeneration system based on a supercritical CO <sub>2</sub> Brayton Cycle driven by a solar power tower plant” K. Mohammadi, <b>K.M. Powell</b> <i>Proceedings of the 26<sup>th</sup> SolarPACES International Conference</i>	In Press
“Real-time optimization using reinforcement learning” <b>K.M. Powell</b> , D. Machalek, T. Quah <i>Computers and Chemical Engineering</i> , Volume 143, 107077	2020

- “Dynamic optimization and economic evaluation of flexible heat integration in a hybrid concentrated solar power plant”  
K. Ellingwood, K. Mohammadi, **K.M. Powell**  
*Applied Energy*, Volume 276, 115513 2020
- “A Novel Means to Flexibly Operate a Hybrid Concentrated Solar Power Plant and Improve Operation During Non-Ideal Direct Normal Irradiance Conditions”  
K. Ellingwood, K. Mohammadi, **K.M. Powell**  
*Energy Conversion and Management*, Volume 203, 112275 2020
- “Design and analysis of a dual-receiver direct steam generator solar power tower plant with a flexible heliostat field”  
M. Saghafifar, K. Mohammadi, **K.M. Powell**  
*Sustainable Energy Technology and Assessments*, Volume 39, 121816 2020
- “Long-term calibration models to estimate ozone concentrations with a metal oxide sensor”  
T. Sayahi, A. Garff, T. Quah, K. Le, T. Becnel, **K.M. Powell**, P.E. Gaillardon, A.E. Butterfield, K.E. Kelly  
*Environmental Pollution*, Volume 267, 115363 2020
- “Novel hybrid solar tower-gas turbine combined power cycles using supercritical carbon dioxide bottoming cycles”  
K. Mohammadi, K. Ellingwood, **K.M. Powell**  
*Applied Thermal Engineering*, Volume 178, 115588 2020
- “Comparing Reinforcement Learning Methods for Real-Time Optimization of a Chemical Process”  
T. Quah, D. Machalek, **K.M. Powell**  
*Processes*, Volume 8(11), 1497 2020
- “A comprehensive review of solar only and hybrid solar driven multigeneration systems: Classifications, benefits, design and prospective”  
K. Mohammadi, S. Khanmohammadi, H. Khorasanizadeh, **K.M. Powell**  
*Applied Energy*, Volume 268, 114940 2020
- “Development of high concentration photovoltaics (HCPV) power plants in the US Southwest: Economic assessment and sensitivity analysis”  
K. Mohammadi, S. Khanmohammadi, H. Khorasanizadeh, **K.M. Powell**  
*Sustainable Energy Technologies and Assessments*, Volume 42, 100873 2020
- “Dynamic Simulation and Techno-Economic Analysis of a Concentrated Solar Power (CSP) Plant Hybridized with both Thermal Energy Storage and Natural Gas”  
K. Mohammadi, M. Saghafifar, K. Ellingwood, **K.M. Powell**  
*Journal of Cleaner Production*, Volume 248, 119193 2020
- “Solving the duck curve in a smart grid environment using a non-cooperative game theory and dynamic pricing profiles”  
M. Sheha, K. Mohammadi, **K.M. Powell**  
*Energy Conversion and Management*, Volume 220, 113102 2020
- “Thermo-economic assessment and optimization of a hybrid triple effect absorption chiller and compressor”  
K. Mohammadi, Y. Jiang, S. Borjian, **K.M. Powell**  
*Sustainable Energy Technologies and Assessments*, Volume 38, 100652 2020

- “Economic and environmental impacts of a non-traditional combined heat and power system for a discrete manufacturing facility”  
D. Machalek, M. Henning, K. Mohammadi, **K.M. Powell**  
*Journal of Cleaner Production*, Volume 265, 121816 2020
- “On-Line Classification of Coal Combustion Quality Using Nonlinear SVM for Improved Neural Network NOx Emission Rate Prediction”  
J.F. Tuttle, L.D. Blackburn, **K.M. Powell**  
*Computers & Chemical Engineering*, Volume 141, 106990 2020
- “Dynamic Economic Optimization of a Continuously Stirred Tank Reactor Using Reinforcement Learning”  
D. Machalek, T. Quah, **K.M. Powell**  
*Proceedings of the 2020 American Control Conference*, pp. 2955-2960 2020
- “A novel triple power cycle featuring a gas turbine cycle with supercritical carbon dioxide and organic Rankine cycles: Thermo-economic analysis and optimization”  
K. Mohammadi, K. Ellingwood, **K.M. Powell**  
*Energy Conversion and Management*, Volume 220, 113123 2020
- “A novel dynamic simulation methodology for high temperature packed-bed thermal energy storage with experimental validation”  
J.F. Tuttle, N. White, K. Mohammadi, **K.M. Powell**  
*Sustainable Energy Technologies and Assessments*, Volume 42, 100888 2020
- “Real-time optimization of multi-cell industrial evaporative cooling towers using machine learning and particle swarm optimization”  
L.D. Blackburn, J.F. Tuttle, **K.M. Powell**  
*Journal of Cleaner Production*, Volume 271, 122175 2020
- “Thermodynamic and Economic Analysis of Different Cogeneration and Trigeneration Systems Based on Carbon Dioxide Vapor Compression Refrigeration Systems”  
K. Mohammadi, **K.M. Powell**  
*Applied Thermal Engineering*, Volume 164, 114503 2020
- “Hybrid Systems Based on Gas Turbine Combined Cycle for Trigeneration of Power, Cooling, and Freshwater: A Comparative Techno-Economic Assessment”  
K. Mohammadi, M.S.E. Khaledi, M. Saghafifar, **K.M. Powell**  
*Sustainable Energy Technologies and Assessments*, Volume 37, 100632 2020
- “Mine Operations as a Smart Grid Resource: Leveraging Excess Process Storage Capacity to Better Enable Renewable Energy Sources”  
D. Machalek, A. Young, L.D. Blackburn, W.P. Rogers, **K.M. Powell**  
*Minerals Engineering*, Volume 145, 106103 2020
- “Using Real-Time Electricity Prices to Leverage Electrical Energy Storage and Flexible Loads in a Smart Grid Environment Utilizing Machine Learning”  
M. Sheha, **K.M. Powell**  
*Processes*, Volume 7 (12), 870 2019
- “Proactive Energy Optimization in Residential Buildings with Weather and Market Forecasts”  
C.R. Simmons, J.R. Arment, **K.M. Powell**, J.D. Hedengren  
*Processes*, Volume 7 (12), 929 2019

- “Sustainable NO<sub>x</sub> Emission Reduction at a Coal-Fired Power Station through the Use of Online Neural Network Modeling and Particle Swarm Optimization”  
J.F. Tuttle, R. Vesel, S. Alagarsamy, L.D. Blackburn, **K.M. Powell**  
*Control Engineering Practice*, Volume 93, 104167 2019
- “Model Predictive Control of a Rotary Kiln for Fast Electric Demand Response”  
D. Machalek, **K.M. Powell**  
*Minerals Engineering*, Volume 144, 106021 2019
- “Analysing the Benefits of Hybridisation and Storage in a Hybrid Solar Gas Turbine Plant”  
K. Ellingwood, S.M. Safdarnejad, H. Kovacs, J.F. Tuttle, **K.M. Powell**  
*International Journal of Sustainable Energy*, Volume 38 (10), pp. 937-965 2019
- “Thermo-Economic Analysis of a Novel Hybrid Multigeneration System Based on an Integrated Triple Effect Refrigeration System for Production of Power and Refrigeration”  
K. Mohammadi, M. Saghafifar, J.G. McGowan, **K.M. Powell**  
*Journal of Cleaner Production*, Volume 238, 117912 2019
- “Smart Scheduling of a Batch Manufacturer’s Operations by Utilization of a Genetic Algorithm to Minimize Electrical Demand”  
P. Brimley, D. Machalek, **K.M. Powell**  
*Smart and Sustainable Manufacturing Systems*, Volume 3 (2), pp. 53-67 2019
- “Hybrid Concentrated Solar Power (CSP)-Desalination Systems: A Review”  
K. Mohammadi, M. Saghafifar, K. Ellingwood, **K.M. Powell**  
*Desalination*, Volume 468, 114083 2019
- “A Novel Hybrid Dual-Temperature Absorption Refrigeration System: Thermodynamic, Economic, and Environmental Analysis”  
K. Mohammadi, M.S.E. Khaledi, **K.M. Powell**  
*Journal of Cleaner Production*, Volume 233, pp. 1075-1087 2019
- “Techno-Economic Evaluation of Different Hybridization Schemes for a Solar Thermal/Gas Power Plant”  
K. Rashid, S.M. Safdarnejad, K. Ellingwood, **K.M. Powell**  
*Energy*, Volume 181, pp. 91-106 2019
- “Automation in the Mining Industry: Review of Technology, Systems, Human Factors, and Political Risk”  
W.P. Rogers, M.M. Kahraman, F.A. Drews, **K.M. Powell**, J.M. Haight, Y. Wang, K. Baxla, M. Sobalkar  
*Mining, Metallurgy, and Exploration*, Volume 36, pp. 607-631 2019
- “Automated Electrical Demand Peak Leveling in a Manufacturing Facility with Short-Term Energy Storage for Smart Grid Participation”  
D. Machalek, **K.M. Powell**  
*Journal of Manufacturing Systems*, Volume 52, pp. 100-109 2019
- “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, **K.M. Powell**  
*The Electricity Journal*, Volume 32 (5), pp. 38-46 2019
- “Development of a Roadmap for Dynamic Process Intensification by Using a Dynamic, Data-Driven Optimization Approach”  
S.M. Safdarnejad, J.F. Tuttle, **K.M. Powell**  
*Chemical Engineering and Processing: Process Intensification*, Volume 140, pp. 100-113 2019

- “Process Intensification of Solar Thermal Power Using Hybridization, Flexible Heat Integration, and Real-Time Optimization”  
K. Rashid, S.M. Safdarnejad, **K.M. Powell**  
*Chemical Engineering and Processing: Process Intensification*, Volume 139, pp. 155-171 2019
- “Fault Detection on Big Data: A Novel Algorithm for Clustering Big Data to Detect and Diagnose Faults”  
A. Smith, **K.M. Powell**  
*International Federation of Automatic Control Papers Online*, Volume 52 (10), pp. 328-333 2019
- “Integrating a Microturbine into a Discrete Manufacturing Process with Combined Heat and Power Using Smart Scheduling and Automation”  
M. Henning, D. Machalek, **K.M. Powell**  
*Computer-Aided Chemical Engineering*, Volume 47, pp. 293-298 2019
- “Designing Flexibility into a Hybrid Solar Thermal Power Plant by Real-Time Adaptive Heat Integration”  
K. Rashid, K. Ellingwood, S.M. Safdarnejad, **K.M. Powell**  
*Computer-Aided Chemical Engineering*, Volume 47, pp. 457-462 2019
- “Dynamic modeling and optimization of a coal-fired utility boiler to forecast and minimize NO<sub>x</sub> and CO emissions simultaneously”  
S.M. Safdarnejad, J.F. Tuttle, **K.M. Powell**  
*Computers & Chemical Engineering*, Volume 124, pp. 62-79 2019
- “An economic and policy case for proactive home energy management systems with photovoltaics and batteries”  
M. Sheha, **K.M. Powell**  
*The Electricity Journal*, 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, **K.M. Powell**  
*Optimization and Engineering*, 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

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- “Long-Term Calibration Models to Predict Ozone Levels with a Metal Oxide Sensor”  
T. Sayahi, A. Garff, T. Quah, K. Le, T. Becnel, **K.M. Powell**, P.E. Gaillardon, A.E. Butterfield, K.E. Kelly  
American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020
- “Comparison of State-of-the-Art Dynamic Machine Learning Methods for MPC of Coal-Fired Utility Generator Performance”  
J.F. Tuttle, L. Blackburn, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020
- “Machine Learning Based Real-Time Optimization of Multi-Cell Industrial Evaporative Cooling Tower”  
L. Blackburn, J.F. Tuttle, **K.M. Powell**  
American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020



“Leveraging the Manufacturing Sector As a Grid Asset through Demand Response – Four Real-World Case Studies”

D. Machalek and **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020

“Enhancing the Department of Energy’s Industrial Assessment Center Experience for Undergraduate Students through Real-World Problem Solving, Research, and Publication”

D. Machalek and **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020

“Long-Term Hybrid AI-Expert Combustion Optimization System for Coal-Fired Electricity Generation NO<sub>x</sub> Reduction”

J.F. Tuttle, R. Vesel, S. Alagarsamy, L. Blackburn, and K.M. Powell

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020

“State-By-State Comparison of the Economic, Environmental, and Energy Impacts of Manufacturing Facilities Integrating Solar Photovoltaic or Combined Heat and Power Systems”

D. Machalek and **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020

“Comparison of Dynamic and Steady-State Machine Learning Based Optimization of a Coal-Fired Boiler”

L. Blackburn, J.F. Tuttle, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, San Francisco, CA, Nov. 2020 2020

“Geographical Impact on Solar Utility and Levelized Cost in Flexible Hybrid CSP Plants”

K. Ellingwood and **K.M. Powell**

SolarPACES International, Albuquerque, NM, Sept. 2020 2020

“Proposal and Assessment of a Novel Multigeneration System Based On A Supercritical CO<sub>2</sub> Brayton Cycle Driven By a Solar Power Tower Plant”

K. Mohammadi and **K.M. Powell**

SolarPACES International, Albuquerque, NM, Sept. 2020 2020

“Dynamic Economic Optimization of a Continuously Stirred Tank Reactor Using Reinforcement Learning”

D. Machalek, T. Quah, and **K.M. Powell**

The American Control Conference 2020, Denver, CO, July 2020 2020

“Flexible Heat Integration to Enhance Solar Energy Utilization in a Hybrid CSP Power Plant”

K. Ellingwood and **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Orlando, FL, Nov. 2019 2019

“Dynamic Optimization to Leverage Flexible Heat Integration within a Hybrid CSP Plant”

K. Ellingwood and **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Orlando, FL, Nov. 2019 2019

“Educating Students and Colleagues on Data Analytics and Machine Learning”

Panel Speakers: M. Rappa, R. Braatz, J. Matranga, and **K.M. Powell**

Foundations of Process Analytics and Machine Learning, Raleigh, NC, Aug. 2019 2019

“Online Classification of Coal Combustion Quality Using Nonlinear SVM for Improved Neural Network Optimizer Performance”

Poster Presentation: J.F. Tuttle and **K.M. Powell**

Foundations of Process Analytics and Machine Learning, Raleigh, NC, Aug. 2019 2019

- “A Novel Algorithm for Clustering Big Data to Detect and Diagnose Faults”  
 Poster Presentation: A. Smith and **K.M. Powell**  
 Foundations of Process Analytics and Machine Learning, Raleigh, NC, Aug. 2019 2019
- “Designing Flexibility into a Hybrid Solar Thermal Power Plant by Real-Time Adaptive Heat Integration”  
 Poster Presentation: K. Rashid, K. Ellingwood, S.M. Safdarnejad, and **K.M. Powell**  
 Foundations of Computer-Aided Process Design, Copper Mountain, CO, July 2019 2019
- “Integrating a Microturbine into a Discrete Manufacturing Process with Combined Heat and Power Using Smart Scheduling”  
 Poster Presentation: M. Henning, D. Machalek, and **K.M. Powell**  
 Foundations of Computer-Aided Process Design, Copper Mountain, CO, July 2019 2019
- “Model Predictive Control of a Rotary Kiln for Fast Electric Demand Response”  
 D. Machalek and **K.M. Powell**  
 Computational Modeling ‘19, Falmouth, Cornwall, UK, June 2019 2019
- “A Novel Predictive Automation Methodology for Mine De-Watering and Intermediate Product Transportation Interacting with the Smart Grid”  
 D. Machalek, A. Young, W.P. Rogers, and **K.M. Powell**  
 Computational Modeling ‘19, Falmouth, Cornwall, UK, June 2019 2019
- “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

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 INVITED PRESENTATIONS, WORKSHOPS, AND CHAIRED SESSIONS
 

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- “Learning III”  
Sze Zheng Yong (Session Chair) and **K.M. Powell** (Co-Chair)  
American Control Conference 2020, Denver, CO, July 2020 2020

- “Aligning Higher Education with Industry 4.0”  
Panel Speakers: E. Trump, M. Parvania, **K.M. Powell**, and A. Young  
OSIsoft Regional Seminar - Salt Lake City, UT, Feb. 2020 2020
- “Advances in Optimization: Global, Surrogate, & Mixed-Integer Models II”  
**K.M. Powell** (Session Chair) and Tony Wu (Co-Chair)  
AIChE National Conference, Orlando, FL, Nov. 2019 2019
- “Quality and Manufacturing”  
**K.M. Powell** (Session Chair)  
Intelligent Manufacturing Systems, Oshawa, Ontario, Canada, Aug. 2019 2019
- “Advanced Manufacturing and Design”  
**K.M. Powell** (Session Chair) and Jason Goepel (Session Chair)  
Foundations of Computer-Aided Process Design (FOCAPD), Denver, CO, July 2019 2019
- “Forecasting and Dynamic Real-Time Optimization of a Campus District Energy System Using PI”  
**K.M. Powell** and W.P. Rogers  
PI World National Users Group Meeting - OSIsoft  
San Francisco, CA, April 2019 2019
- “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

<p>“Design and Operation of Synergistic Solar Hybrids”  <b>K.M. Powell</b>  University of Utah Department of Chemical Engineering  Graduate Research Seminar, Salt Lake City, UT, Oct. 2017</p>	2017
<p>“A Career in the Energy Sector”  <b>K.M. Powell</b>  Given to Students and Energy Professionals  Utah Energy Career Expo, Salt Lake City, UT, June 2017</p>	2017
<p>“Dynamic Optimization of Energy Systems with Energy Storage”  <b>K.M. Powell</b>  Brigham Young University Department of Chemical Engineering  Graduate Research Seminar, Provo, UT, Oct. 2016</p>	2016
<p>“Hybrid Systems, Optimization, and Energy Storage”  <b>K.M. Powell</b>  INL Nuclear Hybrid Energy Systems CORE Workshop, Idaho Falls, ID, June 2013</p>	2013

## RESEARCH GRANTS

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Giv Development, “Affordable and Energy Efficient Housing Through Technological Development” 2021-2024, K.M. Powell (PI), J. Sieving (co-PI), M. Reynolds, **\$120,000**.

Dominion Energy, “Developing Clean Natural Gas Technologies in Utah” 2020-2022, K.M. Powell (PI), K. Kelly (co-PI), D. Pershing (co-PI), J. Sieving (co-PI), **\$1,000,000**.

Utah Governor’s Office of Energy Development, “A Survey of Energy Investment Opportunities in the Agricultural Sector” 2020-2021, J. Sieving (PI), K.M. Powell (co-PI), **\$30,000**.

Department of Energy: Office of Energy Efficiency and Renewable Energy, “Improving the Economics of Industrial Battery Storage: A Proactive Policy and Management Approach” 2020-2021, K.M. Powell (PI), J. Sieving (co-PI), **\$25,000**.

Department of Energy: Office of Fossil Energy, “Deployment of Dynamic Neural Network Optimization to Minimize Heat Rate during Ramping for Coal Power Plants” 2019-2022, K.M. Powell (PI), A. Fry (co-PI), K. Andersson (co-PI), D. Pershing (co-PI), **\$3,784,781**.

Department of Energy: Office of Nuclear Energy, “Proactive Hybrid Nuclear with Load Forecasting” 2019-2022, J.D. Hedengren (PI), M. Memmot (co-PI), K.M. Powell (co-PI), P. Talbot (co-PI), \$799,933 (**\$189,272 to University of Utah**).

Department of Energy: Office of Energy Efficiency and Renewable Energy, “Machine-Learning-Based Optimization of Industrial Cooling Towers” 2018-2019, J. Sieving (PI), K.M. Powell (co-PI), **\$25,000**.

Utah Governor’s Office of Energy Development, “Smart Energy Management in Industrial Systems”, 2017-2021, K.M. Powell (PI), **\$165,000**.

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**.

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. Kuretich, 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**.

#### COMMITTEE APPOINTMENTS AND SERVICE ROLES

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<b>Chair – Engineering Faculty Career Council</b> University of Utah – College of Engineering	2019-Present
<b>Editorial Board Member</b> <i>Processes</i> Journal	2020-Present
<b>Guest Editor for <i>Processes</i> Journal</b> “Modeling, Control, and Optimization of Multi-Generation and Hybrid Energy Systems”	2019-2020
<b>Associate Editor for AIChE Contributed Papers</b> American Control Conference 2020	2019-2020
<b>Webinar Series Committee Member</b> American Institute of Chemical Engineers	2016-Present
<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	2016-2019
<b>University Graduate Fellowship Evaluation Committee Member</b> University of Utah Graduate Fellowship Committee	2016, 2020
<b>Member</b> Computers and Systems Technology (CAST) Division of AIChE	2010-Present
<b>Member</b> American Institute of Chemical Engineers	2006-Present

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**DOCTORAL STUDENTS SUPERVISED**

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<b>Khalid Rashid, Ph.D.</b>	2019
<b>Kevin Ellingwood, Ph.D.</b>	2020
<b>Moataz Sheha, Ph.D.</b>	2020
<b>Jacob Tuttle</b>	2020
<b>Landen Blackburn</b>	2021 (expected)
<b>Derek Machalek</b>	2022 (expected)
<b>Blake Billings</b>	2023 (expected)
<b>An Ho</b>	2023 (expected)
<b>Jake Immonen</b>	2024 (expected)
<b>Michael Reynolds</b>	2024 (expected)
<b>Jiwei Yao</b>	2024 (expected)

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