

# KODY M. POWELL, PH.D.

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## APPOINTMENTS

<b>The University of Utah, SLC, UT</b> <b>Associate Professor of Chemical Engineering</b> <b>John A. and Amy B. Williams Endowed Professor of Energy Systems</b> <b>Adjunct Associate Professor of Mechanical Engineering</b> Research in energy systems (renewable, nuclear, fossil) with a specialty in process modeling, optimization, advanced control, smart grid, demand response, and energy storage <ul style="list-style-type: none"><li>Principal Investigator on \$10.8M in funded projects</li><li>Author of over 100 peer-reviewed research publications</li><li>Primary advisor for 15 graduate students</li><li>Awarded top 15% instructor multiple times</li></ul>	2022-Present
<b>The University of Utah, SLC, UT</b> <b>Assistant Professor of Chemical Engineering</b> <b>Adjunct Assistant Professor of Mechanical Engineering</b> Research in energy systems (renewable, nuclear, fossil) with a specialty in process modeling, optimization, advanced control, and energy storage	2016-2022
<b>U.S. Department of Energy   Industrial Assessment Centers Program</b> <b>Director of the Intermountain Industrial Assessment Center (IIAC)</b> Consulting and team management for 24 students and professionals with a focus on energy efficiency in the manufacturing sector <ul style="list-style-type: none"><li>Trained over 75 students in energy engineering consulting</li><li>Over 100 assessments resulting in \$26.9M cumulative savings</li><li>Awarded Center of Excellence nationally</li></ul>	2016-Present
<b>San Rafael Energy Research Center (A Sabbatical Project)</b> <b>Operations Advisor</b> Startup, grant development, project management, and operations consulting for a research laboratory in an impacted coal community	2022-2023
<b>ExxonMobil Research and Engineering, The Woodlands, TX</b> <b>Real-Time Optimization Research and Development Engineer</b> Real-time optimization, process modeling, machine learning, fault detection, model predictive control, distributed control	2013-2016
<b>The University of Texas at Austin – Utilities and Energy Management</b> <b>Project Leader for Large-Scale Utilities Optimization Project</b> Dynamic real-time optimization of campus-wide utilities, energy demand forecasting, model development for gas and steam turbines, waste heat boilers, centrifugal chillers, cooling towers, energy storage systems	2012 – 2013

## EDUCATION

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<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	

## TEACHING

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<b>Industrial Energy Analysis</b>	2019-Present
<b>Fundamentals of Heat Transfer</b>	2016-Present
<b>Fundamentals of Smart Systems</b>	2017-Present
<b>Cooperative Education (Practicum)</b>	2020-Present

## AWARDS

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<b>John A. and Amy B. Endowed Professorship for Energy Research</b>	2023
<b>Engineering Educator of the Year – Utah Engineers Council</b>	2023
<b>Excellence in Applied Energy Engineering Research – U.S. Department of Energy</b>	2023
<b>Futures Issue Honoree – American Institute of Chemical Engineers (AIChE) Journal</b>	2022
<b>Green Business Award – Utah Business Magazine</b>	2022
<b>Top 15% Rated Undergraduate Instructor (Fall) – U. of Utah College of Engineering</b>	2021
<b>Top 15% Rated Undergraduate Instructor (Spring) – U. of Utah College of Engineering</b>	2021
<b>IAC Center of Excellence – U.S. Department of Energy – Advanced Mfg. Office</b>	2020
<b>2020 Young Investigator of the Year Award – Processes Journal</b>	2020
<b>Excellence in Applied Energy Engineering Research – U.S. Department of Energy</b>	2020
<b>Faculty Career Champion Award – University of Utah Career Center</b>	2020
<b>Patriot Award – Employer Support of the Guard and Reserve</b>	2019
<b>Outstanding Faculty in Chemical Engineering – AIChE Student Chapter</b>	2019
<b>Top 15% Rated Graduate Instructor – U. of Utah College of Engineering</b>	2019
<b>Excellence in Applied Energy Engineering Research – U.S. Department of Energy</b>	2018
<b>Outstanding Faculty in Chemical Engineering – AIChE Student Chapter</b>	2018
<b>Top 15% Rated Graduate Instructor – U. of Utah College of Engineering</b>	2018
<b>Top 15% Rated Undergraduate Instructor – U. of Utah College of Engineering</b>	2017
<b>Excellence in Applied Energy Engineering Research – U.S. Department of Energy</b>	2017
<b>Faculty Career Champion Award – University of Utah Career Center</b>	2017
<b>Top 15% Rated Graduate Instructor – U. of Utah, College of Engineering</b>	2017

**Graduate Research Fellowship Program (GRFP)** – National Science Foundation

2009-2012

**Graduate Research Fellow** – Cockrell School of Engineering

2009-2013

#### PEER-REVIEWED PUBLICATIONS

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“Industrial processes and the smart grid: overcoming the variability of renewables by using built-in process storage and intelligent control strategies”

Y. Chen, B.W. Billings, **K.M. Powell**

*International Journal of Production Research*, Volume 62 (5), 1686-1698

2024

“Dynamic Modeling of a Solar-To-Hydrogen Flexible High Temperature Steam Electrolysis Plant”

J. Immonen, **K.M. Powell**

*SolarPACES Conference Proceedings*, Volume 1

2024

“Hydrogen from solar? A rigorous analysis of solar energy integration concepts for a high temperature steam electrolysis plant”

J. Immonen, **K.M. Powell**

*Energy Conversion and Management*, Volume 298, 117759

2023

“Dynamic simulation of a triple-mode multi-generation system assisted by heat recovery and solar energy storage modules: Techno-economic optimization using machine learning approaches”

J.R. Mehrenjani, A. Gharehghani, S. Ahmadi, **K.M. Powell**

*Applied Energy*, Volume 348, 121592

2023

“Creating an Advanced Sensor Network to calculate real-time, mass-weighted flue gas composition and air heater leakage of a coal-fired utility boiler under dynamic operating conditions”

K. Steward, C. Moran, **K.M. Powell**, J.F. Tuttle, A. Fry

*Journal of Process Control*, Volume 129, 103051

2023

“Are regulations enough to expand industrial demand response? A study of the impacts of policy on industrial demand response in the United States”

B.W. Billings, **K.M. Powell**

*The Electricity Journal*, Volume 36 (4), 107270

2023

“Intelligent Control of Thermal Energy Storage in the Manufacturing Sector for Plant-Level Grid Response”

M.T. Bahr, J. Immonen, B.W. Billings, **K.M. Powell**

*Processes*, Volume 11 (7), 2202

2023

“A multi-scale method for combined design and dispatch optimization of nuclear hybrid energy systems including storage”

D. Hill, D. McCrea, A. Ho, M. Memmott, **K.M. Powell**, J.D. Hedengren

*e-Prime-Advances in Electrical Engineering, Electronics and Energy*, Volume 5, 100201

2023

“Regional impacts on air quality and health of changing a manufacturing facility’s grid-boiler to a combined heat and power system”

E. Safaei Kouchaksaraei, A. Khosravani, **K.M. Powell**, K.E. Kelly

*Journal of the Air & Waste Management Association*, Volume 73 (10), 760-776

2023

“A two-level optimization framework for battery energy storage systems to enhance economics and minimize long-term capacity fading”

J. Yao, J.D. Hedengren, T. Gao, **K.M. Powell**

*Journal of Energy Storage*, Volume 63, 106943

2023

“Two-line-same-phase AC standstill measurement method for obtaining accurate PMSM d–q-axis inductance values”

F. Yao, M. Li, L. Ge, W. Liao, **K.M. Powell**

*Journal of Power Electronics*, Volume 23, 1353-1363 2023

“Exploring the benefits of molten salt reactors: An analysis of flexibility and safety features using dynamic simulation”

A. Ho, M. Memmott, J.D. Hedengren, **K.M. Powell**

*Digital Chemical Engineering*, Volume 7, 100091 2023

“Physics-guided neural networks with engineering domain knowledge for hybrid process modeling”

E.R. Gallup, T. Gallup, **K.M. Powell**

*Computers & Chemical Engineering*, Volume 170, 108111 2023

“Conversion of food waste to renewable energy: A techno-economic and environmental assessment”

Y. Chen, L. Pinegar, J. Immonen, **K.M. Powell**

*Journal of Cleaner Production*, Volume 385, 135741 2023

“Challenges of reaching high renewable fractions in hybrid renewable energy systems”

A. Khosravani, E. Safaei, M. Reynolds, K.E. Kelly, **K.M. Powell**

*Energy Reports*, Volume 9, pp. 1000-1017 2023

“Dynamic event-based forecasting-aided state estimation for active distribution systems subject to limited communication resource”

X. Bai, X. Zheng, L. Ge, W. Liao, **K.M. Powell**, J. Zhang

*Electric Power Systems Research*, Volume 221, 109417 2023

“The impact of the electrification of buildings on the environment, economics, and housing affordability: A grid-response and life cycle assessment approach”

M.R.T. Williams, M. Reynolds, C. Parker, J. Chen, **K.M. Powell**

*Digital Chemical Engineering*, Volume 7, 100086 2023

“A review on the application of machine learning for combustion in power generation applications”

K. Mohammadi, J. Immonen, L.D. Blackburn, J.F. Tuttle, K. Andersson, **K.M. Powell**

*Reviews in Chemical Engineering*, Volume 39 (6), 1027-1059 2023

“Grid-responsive smart manufacturing: A perspective for an interconnected energy future in the industrial sector”

B.W. Billings, **K.M. Powell**

*AIChE Journal*, Volume 68 (12), e17920 2022

“Dynamic machine learning-based optimization algorithm to improve boiler efficiency”

L.D. Blackburn, J.F. Tuttle, K. Andersson, J.D. Hedengren, **K.M. Powell**

*Journal of Process Control*, Volume 120, pp. 129-149 2022

“Dynamic energy system modeling using hybrid physics-based and machine learning encoder-decoder models”

D. Machalek, J.F. Tuttle, K. Andersson, **K.M. Powell**

*Energy and AI*, Volume 9, 100172 2022

“System benefits of industrial battery storage: A comparison of grid and facility control and dispatch”

B.W. Billings, A. Ho, M. Sahraei-Ardakani, **K.M. Powell**

*Sustainable Energy Grids and Networks*, Volume 32, 100958 2022

- "Optimization of solar-coal hybridization for low solar augmentation"  
A.T. Bame, J. Furner, I. Hoag, K. Mohammadi, **K.M. Powell**, B.D. Iverson  
*Applied Energy*, Volume 319, 119225 2022
- "A nuclear-hydrogen hybrid energy system with large-scale storage: A study in optimal dispatch and economic performance in a real-world market"  
A. Ho, D. Hill, J.D. Hedengren, **K.M. Powell**  
*Journal of Energy Storage*, Volume 51, 104510 2022
- "A two-stage deep learning framework for early-stage lifetime prediction for lithium-ion batteries with consideration of features from multiple cycles"  
J. Yao, **K.M. Powell**, T. Gao  
*Frontiers in Energy Research*, Volume 10, pp. 1752 2022
- "Grid-Responsive Smart Manufacturing: Can the Manufacturing Sector Help Incorporate Renewables?"  
Y. Chen, B. Billings, S. Partridge, B. Pruneau, **K.M. Powell**  
*International Federation of Automatic Control Papers Online*, Volume 55 (10), pp. 637-642 2022
- "Dynamic optimization with flexible heat integration of a solar parabolic trough collector plant with thermal energy storage used for industrial process heat"  
J. Immonen, **K.M. Powell**  
*Energy Conversion and Management*, Volume 267, 115921 2022
- "Industrial battery operation and utilization in the presence of electrical load uncertainty using Bayesian decision theory"  
B.W. Billings, P.J. Smith, S.T. Smith, **K.M. Powell**  
*Journal of Energy Storage*, Volume 53, 105054 2022
- "Techno-economic sensitivity analysis for combined design and operation of a small modular reactor hybrid energy system"  
D. Hill, A. Martin, N. Martin-Nelson, C. Granger, M. Memmott, **K.M. Powell**, J.D. Hedengren  
*International Journal of Thermofluids*, Volume 16, 100191 2022
- "Simulating a solar parabolic trough collector plant used for industrial process heat using an optimized operating scheme that utilizes flexible heat integration"  
J. Immonen, K. Mohammadi, **K.M. Powell**  
*Solar Energy*, Volume 236, pp. 756-771 2022
- "Development of Novel Dynamic Machine Learning-based Optimization of a Coal-fired Power Plant"  
L.D. Blackburn, J.F. Tuttle, K. Andersson, A. Fry, **K.M. Powell**  
*Computers & Chemical Engineering*, Volume 163, 107848 2022
- "Scenario generation for cooling, heating, and power loads using generative moment matching networks"  
W. Liao, Y. Wang, **K.M. Powell**, Q. Liu  
*CSEE Journal of Power and Energy Systems*, Volume 8 (6), pp. 1730-1740 2022
- "Thermoeconomic analysis of flexible heat integration in concentrated solar power plants relative to geographical location"  
K. Ellingwood, **K.M. Powell**  
*AIP Conference Proceedings*, Volume 2445, 030006 2022

- “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, **K.M. Powell**  
*AIP Conference Proceedings*, Volume 2445, 030016 2022
- “Enhancing fault detection with clustering and covariance analysis”  
E. Gallup, T. Quah, D. Machalek, **K.M. Powell**  
*International Federation of Automatic Control Papers Online*, Volume 55 (2), pp. 258-263 2022
- “Dynamic simulation of a novel nuclear hybrid energy system with large-scale hydrogen storage in an underground salt cavern”  
A. Ho, K. Mohammadi, M. Memmott, J.D. Hedengren, **K.M. Powell**  
*International Journal of Hydrogen Energy*, Volume 46 (61), pp. 31143-31157 2021
- “Improving the economics of battery storage for industrial customers: Are incentives enough to increase adoption?”  
A. Dougherty, B. Billings, N. Camacho, **K.M. Powell**  
*The Electricity Journal*, Volume 34 (9), 107027 2021
- “A novel implicit hybrid machine learning model and its application for reinforcement learning”  
D. Machalek, T. Quah, **K.M. Powell**  
*Computers & Chemical Engineering*, Volume 155, 107496 2021
- “Thermoeconomic evaluation and optimization of using different environmentally friendly refrigerant pairs for a dual-evaporator cascade refrigeration system”  
K. Mohammadi, **K.M. Powell**  
*Processes*, Volume 9 (10), 1855 2021
- “Benchmarks for grid energy management with Python Gekko”  
N.S. Gates, D.C. Hill, B.W. Billings, **K.M. Powell**, J.D. Hedengren  
*Proceedings of the 60th IEEE Conference on Decision and Control*, pp. 4868-4874 2021
- “Comparison of the most likely low-emission electricity production systems in Estonia”  
Z.S. Baird, D. Neshumayev, O. Järvik, **K.M. Powell**  
*PLoS ONE*, Volume 16 (12), e0261780 2021
- “Thermoeconomic analysis of a multigeneration system using waste heat from a triple power cycle”  
K. Mohammadi, J.G. McGowan, **K.M. Powell**  
*Applied Thermal Engineering*, Volume 190, 116790 2021
- “State-by-State comparison of combined heat and power to photovoltaic installations at manufacturing facilities with heat and power loads”  
D. Machalek, K. Mohammadi, **K.M. Powell**  
*Sustainable Energy Technologies and Assessments*, Volume 47, 101502 2021
- “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, **K.M. Powell**  
*Applied Energy*, Volume 282, 116168 2021
- “Modeling, Control, and Optimization of Multi-Generation and Hybrid Energy Systems”  
**K.M. Powell**, K. Mohammadi  
*Processes*, Volume 9 (7), 1125 2021

“A systematic comparison of machine learning methods for modeling of dynamic processes applied to combustion emission rate modeling”

J.F. Tuttle, L.D. Blackburn, K. Andersson, **K.M. Powell**  
*Applied Energy*, Volume 282, 116886 2021

“Techno-economic analysis and environmental benefits of solar industrial process heating based on parabolic trough collectors”

K. Mohammadi, S. Khanmohammadi, J. Immonen, **K.M. Powell**  
*Sustainable Energy Technologies and Assessments*, Volume 47, 101412 2021

“Real-time optimization using reinforcement learning”

**K.M. Powell**, D. Machalek, T. Quah  
*Computers and Chemical Engineering*, 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

“Dynamic Simulation and Techno-Economic Analysis of a Concentrated Solar Power (CSP) Plant Hybridized with both Thermal Energy Storage and Natural Gas”

K. Rashid, K. Mohammadi, **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
- "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
- "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. Saghaififar, **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 NOx 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. Saghaififar, 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. Saghaififar, 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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“Effective Control of High Temperature Steam Electrolyzer Modules That Use Variable, Renewable Electricity”

J. Immonen, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Orlando, FL, Nov. 2023 2023

“Operational, Economic, and Environmental Comparisons of Solar Energy Integration Methods for a High Temperature Steam Electrolysis Plant”

J. Immonen, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Orlando, FL, Nov. 2023 2023

“Dynamic Optimization of Complex Combustion Systems with Transformer Neural Networks”

E. Gallup, J.F. Tuttle, B. Billings, J. Immonen, **K.M. Powell**

Foundations of Process Analytics and Machine Learning, Davis, CA, Aug. 2023 2023

“Opportunities for Industrial Demand Response: A Survey of Grid-Responsive Smart Manufacturing Applications”

B. Billings, **K.M. Powell**

Foundations of Computer-Aided Process Operations, San Antonio, TX Jan. 2023 2023

“Grid-Responsive Smart Manufacturing: A Perspective for an Interconnected Energy Future in the Industrial Sector”

B. Billings, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

“Grid-Responsive Smart Automation Methods to Incorporate Renewable Energy Sources – a Case Study”

Y. Chen, B. Billings, S. Partridge, B. Pruneau, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

“A Physics-Informed Machine Learning Model for Battery Capacity Fading Prediction with Early Cycling Data”

J. Yao, B. Jiang, **K.M. Powell, T. Gao**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

“An Optimal Dispatch and Economic Performance Study of a Nuclear-Hydrogen Hybrid Energy System with Large-Scale Storage in Underground Salt Cavern”

A. Ho, D. Hill, J.D. Hedengren, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

“Techno-Economic and Environmental Analysis of the Conversion of Food Waste to Renewable Energy”

Y. Chen, E.G. Pinegar, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

“A Two-Level Optimization Framework with Consideration of Economic Benefits and Long-Term Capacity Fading for Battery Energy Storage Systems”

J. Yao, T. Gao, J.D. Hedengren, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

“Dynamic Modeling and Simulation of a Novel Nuclear-Hydrogen Hybrid Energy System with Large-Scale Storage in an Underground Salt Cavern”

A. Ho, K. Mohammadi, M. Memmott, J.D. Hedengren, **K.M. Powell**

American Institute of Chemical Engineers Annual Conference, Phoenix, AZ, Nov. 2022 2022

- “Getting more from solar by finding synergies in hybrid systems with combustible fuels”  
**K.M. Powell**  
 Clearwater Clean Energy Conference, Clearwater, FL, Aug. 2022 2022
- “Dynamic optimization of power plants using machine learning models”  
 J.F. Tuttle and **K.M. Powell**  
 Clearwater Clean Energy Conference, Clearwater, FL, Aug. 2022 2022
- “Grid-responsive smart manufacturing: can the manufacturing sector help incorporate renewables?”  
 Y. Chen, B. Billings, S. Partridge, B. Pruneau, and **K.M. Powell**  
 10<sup>th</sup> IFAC Conference on Manufacturing, Modelling, Management, and Control  
 Nantes, France, June 2022 2022
- “Enhancing fault detection with clustering and covariance analysis”  
 E. Gallup, T. Quah, D. Machalek, and **K.M. Powell**  
 14<sup>th</sup> IFAC Conference on Intelligent Manufacturing Systems, Tel Aviv, Israel, Mar. 2022 2022
- “Benchmarks for grid energy management with Python Gekko”  
 N.S. Gates, D.C. Hill, B.W. Billings, **K.M. Powell**, J.D. Hedengren  
 60th IEEE Conference on Decision and Control, Austin, TX, Dec. 2021 2021
- “Economic Analysis and Environmental Impact of a Novel Solar Parabolic Trough Plant Used for Industrial Process Heat That Utilizes Flexible Heat Integration”  
 J. Immonen, K. Mohammadi, **K.M. Powell**  
 American Institute of Chemical Engineers Annual Conference, Boston, MA, Nov. 2021 2021
- “Industrial Battery Storage Dispatch and Optimization Using Gaussian Process Regression and Bayesian Decision Theory”  
 B. Billings, P. Smith, S. Smith, **K.M. Powell**  
 American Institute of Chemical Engineers Annual Conference, Boston, MA, Nov. 2021 2021
- “Modeling and Optimization of a Novel Solar Parabolic Trough Plant Used for Industrial Process Heat That Utilizes Flexible Heat Integration”  
 J. Immonen, K. Mohammadi, **K.M. Powell**  
 American Institute of Chemical Engineers Annual Conference, Boston, MA, Nov. 2021 2021
- “Improving the Economics of Industrial Battery Storage: A Proactive Policy and Management Approach”  
 B. Billings, A. Dougherty, N. Camacho, **K.M. Powell**  
 American Institute of Chemical Engineers Annual Conference, Boston, MA, Nov. 2021 2021
- “Optimizing the Use of Solar Industrial Process Heat through Flexible Heat Integration”  
 J. Immonen, K. Mohammadi, **K.M. Powell**  
 3<sup>rd</sup> Solar Energy Systems Conference, Virtual Conference, Aug. 2021 2021
- “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

“Fault Detection on Big Data: A Novel Algorithm for Clustering Big Data to Detect and Diagnose Faults”

A. Smith and **K.M. Powell**

Intelligent Manufacturing Systems Conference, Oshawa, Ontario, Canada, Aug. 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
- “Real-time Optimization of Chillers with Thermal Energy Storage and Variable Electricity Rates”  
 L.D. Blackburn, J.D. Hedengren, **K.M. Powell**  
 INFORMS Annual Meeting, Phoenix, AZ, Nov. 2018 2018
- “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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“Unconventional Oil and Natural Gas: Science & Technology Advancement”

J. McLennan (Chair) and **K.M. Powell** (Co-Chair)

AIChE National Conference, Orlando, FL, Nov. 2023 2023

“Workforce Needs for the Future”

N. Luke, **K.M. Powell**, R. Hammond, T. Lewis

U.S. Department of Energy - Industrial Heat Shot Summit (Virtual), October 2023 2023

“Working Smarter, Not Just Harder: Improving Energy Performance Using Intelligent Operation”

**K.M. Powell**

Energy and Geoscience Institute Corporate Associates Annual Meeting, Sept. 2023 2023

“Industrial Assessment Centers: Working with States to Make an Impact on Decarbonization”

**K.M. Powell**

National Association of State Energy Offices Webinar Series, May 2023 2023

“An Uncomfortable Conversation about the Future of Coal and the Communities that Depend on It”

**K.M. Powell**

University of Utah Department of Chemical Engineering

Graduate Research Seminar, Salt Lake City, UT, Oct. 2023 2023

“Inspiring a Clean Energy Workforce”

J. Smegal, E. Languri, **K.M. Powell**, P. Kiser, K. Cetin

U.S. Department of Energy Better Buildings Webinar Series, November 2022 2022

“Sustainable Manufacturing: What Is It and Why Is It Important?”

M. Bogoshian, P. Langlois, K. Gordon, **K.M. Powell**, J. States, M. Ureste

American Manufacturing Communities Collaborative, Virtual Briefing, June 2022 2022

“Smart Manufacturing Systems”

**K.M. Powell** (Chair)

10<sup>th</sup> IFAC Conference on Manufacturing, Modelling, Management, and Control

Nantes, France, June 2022 2022

“Automation Opportunities in the Manufacturing Sector to Improve Smart Grid Participation”

**K.M. Powell**

Invited talk

Trends in Invigoration of Manufacturing and Engineering (TIME) by AIChE, Virtual, July 2021 2021

“Maximizing Renewable Energy Resource Utilization through Hybridization and Systems Engineering”

**K.M. Powell**

Brigham Young University and University of Utah Departments of Chemical Engineering

Joint Graduate Research Seminar, Salt Lake City, UT, April 2021 2021

“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 Conference, 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 Champions 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**

INL Nuclear Hybrid Energy Systems CORE Workshop, Idaho Falls, ID, June 2013

2013

## RESEARCH GRANTS

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Department of Energy: Office of Fossil Energy and Carbon Management, “Charting a Path Forward: Energy and Economic Transition Pathways for Utah’s Coal Country”, 2024-2026, K.M. Powell (PI), J. Robinson (Co-PI), W.P. Rogers (co-PI), **\$748,988**.

Department of Energy: Industrial Efficiency & Decarbonization Office, “Upper-West Onsite Energy Technical Assistance Partnership”, 2024-2027, Cascade Energy (Lead), K.M. Powell (Co-PI), **\$900,000 (\$180,000 to University of Utah)**.

Department of Energy: Office of Manufacturing and Energy Supply Chains, “The Weber State University Industrial Assessment Center”, 2024-2027, Weber State University (Lead), K.M. Powell (Co-PI), **\$550,000 (\$102,579 to University of Utah)**.

Department of Energy: Office of Energy Efficiency and Renewable Energy, “Increasing the Accessibility of Industrial Electric Load Profile Data: Tools for Organization and Benchmarking” 2023-2024, B. Billings (PI), K.M. Powell (Co-PI), J. Sieving (co-PI), **\$25,000**.

Department of Energy | Office of Energy Efficiency and Renewable Energy, “Commercial Buildings Pilot Program | Intermountain Industrial Assessment Center”, 2022-2026, K.M. Powell (PI), J. Sieving (co-PI), D. Pershing (co-PI), **\$500,000**.

Department of Energy Office of Energy Efficiency and Renewable Energy and Rocky Mountain Power, “Intermountain Industrial Assessment Center”, 2021-2026, K.M. Powell (PI), J. Sieving (co-PI), D. Pershing (co-PI), **\$2,194,700**.

Giv Development, “Affordable and Energy Efficient Housing Through Technological Development” 2021-2026, K.M. Powell (PI), J. Sieving (co-PI), M. Reynolds, **\$315,000**.

Dominion Energy, “Developing Clean Natural Gas Technologies in Utah” 2020-2024, K.M. Powell (PI), K. Kelly (co-PI), D. Pershing (co-PI), J. Sieving (co-PI), **\$1,500,000**.

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” 2019-2023, 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” 2019-2023, J.D. Hedengren (PI), M. Memmott (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”, 2017-2024, K.M. Powell (PI), **\$255,000**.

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. 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**.

#### COMMITTEE APPOINTMENTS AND SERVICE ROLES

<b>Director of Graduate Recruiting</b>	2023-Present
University of Utah – Department of Chemical Engineering	
<b>Young Editorial Board</b>	2022-Present
<i>Applied Energy</i>	
<b>Graduate Committee Member</b>	2020-Present
University of Utah – Department of Chemical Engineering	
<b>Assistant Student Branch Advisor</b>	2022-Present
University of Utah – ASHRAE	

<b>Chair – Engineering Faculty Career Council</b> University of Utah – College of Engineering	2019-2023
<b>Editorial Board Member</b> <i>Processes Journal</i>	2020-2022
<b>Teaching Excellence Committee Member</b> University of Utah – College of Engineering	2021-2022
<b>Guest Editor for <i>Processes Journal</i></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	2016-2021
<b>Member</b> Department of Chemical Engineering Faculty Search Committee	2018-2019
<b>Student Career Advisor</b> Department of Chemical Engineering Service Assignment	2016-2023
<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> American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)	2022-Present
<b>Affiliate</b> International Federation of Automatic Control (IFAC)	2019-Present
<b>Member</b> American Society of Engineering Educators	2017-Present
<b>Member</b> Computers and Systems Technology (CAST) Division of AIChE	2010-Present
<b>Member</b> American Institute of Chemical Engineers	2006-Present

#### 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, Ph.D.</b> (NSF Graduate Research Fellowship Recipient)	2020
<b>Derek Machalek, Ph.D.</b>	2021
<b>Landen Blackburn, Ph.D.</b>	2022

<b>Blake Billings, Ph.D.</b>	2023
<b>An Ho, Ph.D.</b>	2023
<b>Jake Immonen</b>	2024 (expected)
<b>Jiwei Yao</b>	2024 (expected)
<b>Yunzhi Chen</b>	2025 (expected)
<b>R.T. Williams</b> (DOE IBUILD Fellowship Program Recipient)	2025 (expected)
<b>Ali Khosravani</b>	2026 (expected)
<b>Mohamed Bahr</b>	2026 (expected)
<b>Matthew DeHaan</b>	2027 (expected)
<b>Tran Diep</b>	2027 (expected)

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**MASTERS STUDENTS SUPERVISED**

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<b>Michael Reynolds</b>	2022
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