Bianca Howard PhD, FHEA

Assistant Professor, Department of Mechanical Engineering, Columbia University
b.howard@columbia.edu | +1-212-853-3987 |

Education

Degree	Discipline	University	Year
PhD	Mechanical Engineering	Columbia University in the City of New York	2016
MSc	Mechanical Engineering	Columbia University in the City of New York	2011
BSc	Mechanical Engineering	University of Nebraska - Lincoln	2009

Positions

Title	Institution	Department	Dates
Assistant Professor	Columbia University	Department of Mechanical Engineering	2022-present
Senior Lecturer	Loughborough University	School of Architecture Building and Civil Engineering	2021 - 2022
Lecturer (Assistant Professor)	Loughborough University	School of Architecture Building and Civil Engineering	2017 - 2021
Research Associate	Imperial College London	Department of Civil and Environmental Engineering	2015 - 2017
Research Assistant	Columbia University	Department of Mechanical Engineering	2010 - 2015

Grants Awarded

ESPRC: Engineering and Physical Science Research Council; NSF: National Science Foundation

Amount	Role	Funding body	Title	Year
$100,000	Co-Investigator	US DOE	Smart Energy Storage Integration and Management Platform for Buildings (SESIMP-B)	2023
$85,000	Principal Investigator	Columbia Engineering	Illuminating the Cobenefits of Building Decarbonization	2023
£497,477	Principal Investigator	UK EPSRC	Innovation Fellowship FlexTECC: Flexible Timing of Energy Consumption in Communities (2018-2021)	2018
£1,500	Principal Investigator	Santander	Mobility Travel Grant: Decentralized Electricity Provision in Haiti	2018
$84,000	Trainee	US NSF	IGERT Fellowship: Solving Urbanization Challenges Through Design	2011
$77,000	Scholarship Recipient	University of Nebraska Lincoln	Engineering and Technology Scholarship	2005

Teaching Roles

Course	Role	Degree Program	Year[s]
Columbia University			
Building Energy Modeling and Simulation	Responsible Examiner	BS/MS in Mechanical Engineering	2022-Present
	Lecturer Topics: Building Simulation: Steady-State and Dynamic Building Energy Modelling, Mechanical Systems Sizing and Selection DesignBuilder/Energyplus, Sensitivity and Uncertainty Analysis, Occupancy Modeling **Student Evaluations:** 2022:4.7/5.0;		
Loughborough University			
Building Energy Modelling	Responsible Examiner	MRes in Energy Resilience in the Built Environment	2019- 2021
	Lecturer Topics: Building Simulation: Steady-State and Dynamic Building Energy Modelling, Critical Evaluation and Selection of Building Simulation tools: SAP, Energyplus, Dymola/Modelica, Sensitivity and Uncertainty Analysis **Student Evaluations:** N/A due to covid, Generally good feedback		
Controls & Commissioning	Co-Tutor	MSc in Low Energy Building Services Engineering	2018 - 2021
	Lecture Topics: Model Predictive Control, Smart Meters, Condition Based Maintenance, Fault Detection & Diagnosis **Student Evaluations:** 4.5/5.0		
Building Energy Supply Systems & District Heating Networks	Co-Tutor	MSc in Low Energy Building Services Engineering	2018 - 2021
	Lecture Topics: District Heating Systems: Optimal Sizing and operation **Student Evaluations:** 4.6/5.0		
Collaborative BIM	Responsible Examiner	BSc Architectural Engineering and Design Management	2018 -2021
	Lecture Topics: Common Data Environments, Collaborative and Group Working Theory, Mechanical System Design with REVIT **Student Evaluations:** 4.3/5.0		
Building Science	Co-Tutor	BArch Architecture	2017 - 2021
	Lecture Topics: Sustainable Cities and Communities, Building Energy Services, Primary Heating and Cooling Systems, Electrical Systems **Student Evaluations**: 4.0/5.0		
Imperial College			
Urban Energy Systems	Tutor	MSc Sustainable Energy Futures	2016 - 2018
Columbia University			
Energy Sources & Conversion	Teaching Assistant	BSc/MSc in Mechanical Engineering	2013

Mechanical Engineering Lab II	Teaching Assistant	BSc in Mechanical Engineering	2013

Research Supervision

Name	Role/Program	Role	Year
Matthew Kerr	PhD Columbia University	Research Advisor	2022- Present
	Title: Multi-task Action Masking Deep Reinforcement Learning for Building Energy Systems		
Argyris Oraiopoulos	Research Associate (Postdoc) on FlexTECC Fellowship	Line Manager	2019- 2021 -> Postdoc ETH
Rami El Geneidy	PhD: Loughborough University	Primary Supervisor	2017-2021 Graduated -> Startup: Kapacity
	Title: Engineering Energy Flexibility into Communities: Design and Implementation of Control Strategies for Demand Response.		
Vincenzo Rossi	PhD: Loughborough University	Primary Supervisor	2019 – Present -> Postdoc Loughborough/UK BEIS
	Title: Long-Term Planning for retrofitting the UK building stock: Incorporating affordability constraints in large scale multi-objective discrete optimizations		
Riccardo Talami	PhD Loughborough University	Secondary Supervisor	2019- 2022 Graduated - > Postdoc NTU
	Title: Evaluating the computational efficiency of simultaneous whole-building design optimisation		
Sidd Shahnewaz	PhD University College Cork	Secondary Supervisor	2020-2022
	Title: Non-intrusive Load monitoring to identify energy flexibility assets in the Industrial Sector		
Heather Hou	PhD: Imperial College London	Secondary Supervisor	2018- 2021 Graduated -> Industry
	Title: Methods for Incorporating the Influence of the urban environment on building occupancy modelling		

Evidence of Esteem

Invited Talks	Columbia University, Autodesk Digital Construction Summer School, Cornell University, National Renewable Energy Laboratory, Stuttgart University of Applied Sciences, London South Bank University, ETH Zurich Colloquium on Smart Building Solutions, University of Austin Texas: Department of Civil and Environmental Engineering, International Building Performance and Simulation Association, University of Nebraska Lincoln: Department of Architectural Engineering, International District Energy Association Annual Conference
Advisory Committees	Multi-Perspective Analysis of Future Energy System Structures Advisory Group, US National Renewable Energy Laboratory 2020 -2021 Flexibility Metrics Technical Advisory Group, US Lawrence Berkeley National Lab 2019 - 2021 Leicester Smart City Stakeholder Meeting, Leicester Council, Spring 2019 London Energy Plan, Greater London Authority, Summer 2015 CHP Working Group, NYC Long Term Planning and Sustainability, 2012-2013

Reviewer	BuildSys Technical Program Committee 2023, Building Simulation Conference 2021, Building Simulation and Optimization Conference 2020, Journal of Building Performance Simulation, Building & Environment, Applied Energy, Energy & Buildings, Journal of Industrial Ecology, Environmental Pollution, Cities, Utilities Policy, Renewable and Sustainable Energy Reviews
Professional Bodies and Organisations	**Board Member**, Green Construction Board, Construction Leadership Council 2020 **Conference Chair**, Building Simulation and Optimisation Virtual Conference 2020, International Building Performance Simulation Association (IBPSA) -England **Co-opted Board Member**, IBPSA-England 2019 - 2021 **Expert Member**, International Energy Association, Energy in Buildings and Communities, Annex 67, Energy Flexible Buildings **Expert Member**, International Energy Association, Energy in Buildings and Communities, Annex 82, Energy Flexible Buildings for Resilient Energy Networks **Member**, UK EPSRC Peer Review College **Reviewer Pool**, US DOE Building Technology Office
Press	National Geographic, City of Lights, 2012 Elle Magazine, 2012 Genius Awards

List of Publications

Journal Articles (Supervised PhD's and postdocs)

[11] **Hou H**, Pawlak J, Sivakumar A, **Howard B**. (2022). Building occupancy modelling at the district level: A combined copula-nested hazard-based approach. **Building and Environment**. 2022 November; 225:109661-. DOI: 10.1016/j.buildenv.2022.109661

[10] **Oraiopoulos A.**, **Howard B**. (2022). On the accuracy of Urban Building Energy Modelling. **Renewable and Sustainable Energy Reviews**. 2022 April; 158:111976-. DOI:10.1016/j.rser.2021.111976

[9] **Siddiquee, S**., **Howard, B.,** Burton, K., Brem, A., O'Sullivan, D. (2021) Progress in Demand Response and It's Industrial Applications. **Frontiers in Energy Research**, Volume 9, ISSN: 2296-598X doi: 10.3389/fenrg.2021.673176

[8] **Hou, H**, Pawlak, J, Sivakumar, A, **Howard, B**, Polak, J (2020) An approach for building occupancy modelling considering the urban context, **Building and Environment**, 183, 107126, ISSN: 0360-1323. DOI: 10.1016/j.buildenv.2020.107126.

[7] Junker, R, Kallesøe, C, Real, J, **Howard, B**, Lopes, R, Madsen, H (2020) Stochastic nonlinear modelling and application of price-based energy flexibility, **Applied Energy**, 275, 115096, ISSN: 0306-2619.

[6] **El-Geneidy, R.** and **Howard, B** (2020) Contracted energy flexibility characteristics of communities: Analysis of a control strategy for demand response, **Applied Energy**, 263, 114600, ISSN: 0306-2619. DOI: 10.1016/j.apenergy.2020.114600.

[5] **Howard, B**, Acha, S, Shah, N, Polak, J (2019) Implicit Sensing of Building Occupancy Count with Information and Communication Technology Data Sets, **Building and Environment**, ISSN: 1873-684X.

[4] **Howard, B**, Waite, M, Modi, V (2017) Current and near-term GHG emissions factors from electricity production for New York State and New York City, **Applied Energy**, 187, pp.255-271, ISSN: 0306-2619. DOI: 10.1016/j.apenergy.2016.11.061.

[3] **Howard, B** and Modi, V (2017) Examination of the optimal operation of building scale combined heat and power systems under disparate climate and GHG emissions rates, **Applied Energy**, 185, pp.280-293, ISSN: 0306-2619. DOI: 10.1016/j.apenergy.2016.09.108.

[2] **Howard, B**, Saba, A, Gerrard, M, Modi, V (2014) Combined heat and power's potential to meet New York City's sustainability goals, **Energy Policy**, 65, pp.444-454, ISSN: 0301-4215. DOI: 10.1016/j.enpol.2013.10.033.

[1] **Howard, B**, Parshall, L, Thompson, J, Hammer, S, Dickinson, J, Modi, V (2012) Spatial distribution of urban building energy consumption by end use, **Energy and Buildings,** 45, pp.141-151, ISSN: 0378-7788. DOI: 10.1016/j.enbuild.2011.10.061.

Conference Papers

[16] **Siddiquee, S**., **Howard, B.,** Burton, K., O'Sullivan, D. (2022) A Data-driven Assessment Model for Demand Response Participation Benefit of Industries, 2022 IEEE Texas Power and Energy Conference, TPEC 2022

[15] **Talami, R**., Wright, J., **Howard, B.** (2021) Performance robustness assessment of a sequential and a simultaneous whole-building optimization process, Building Simulation 2021 Bruges, Belgium

[14] **Rossi, V**., Wright, J., **Howard, B.** (2021) Evaluating the regional implications of income-aware building stock retrofit strategies through constrained multi-objective optimization, Building Simulation 2021 Bruges, Belgium

[13] **Rossi, V**., Wright, J., **Howard, B.** (2020) Incorporating social-demographic constraints in multi-objective building stock retrofit optimization. USim2020 – Urban Energy Simulation, Edinburgh Nov 2020

[12] **Siddiquee, S**., **Howard, B.,** Bruton,K., O'Sullivan, D. (2020), Demand Response in Smart Grid – A Systematic Mapping Study, 2nd International Conference on Smart Power and Internet Energy Systems, Bangkok, Thailand Sept 2020

[11] **Oraiopolous, A**. and **Howard, B.** (2020) An automated workflow using stochastic time series modelling for building thermal dynamics forecasting. IBPSA- England Building Simulation and Optimization Conference 2020, Sept 2020, Loughborough University.

[10] **El Geneidy, R**., Allinson, D., **Howard, B**. (2020) Energy flexibility potential of an English home: verifying use of adaptive data-driven models for model-predictive control. IBPSA- England Building Simulation and Optimization Conference 2020, Sept 2020, Loughborough University.

[9] **Talami,R**., Wright,J., **Howard, B.** (2020) A Comparison Between Sequential And Simultaneous Whole-building Design Optimization. IBPSA- England Building Simulation and Optimization Conference 2020, Sept 2020, Loughborough University.

[8] **El Geneidy, R**. and **Howard, B**. (2019) Delivery of Contracted Energy Flexibility from Communities. IPBSA Building Simulation Conference 2019, Sept 2019 Rome, Italy.

[7] Firth, S, **Howard, B**, Wright, J (2018) OPEN SCIENCE BUILDING STOCK MODELLING: AN EXAMPLE USING GBXML, OPENBUILDING AND ENERGYPLUS. In *uSim 2018*, Glasgow, UK.

[6] **El Geneidy, R**. and **Howard, B** (2018) Review of Techniques to Enable Community-Scale Demand Response Strategy Design. In *uSim2018 - Urban Energy Simulation*, Glasgow.

[5] **Howard**,B., Acha, S., Shah,N., Polak,J. (2017) "Dynamic Scheduling of HVAC Systems using Access Control Data", ASHRAE Annual Conference 2017, Conference Paper, June 2017

[4] **Howard,B.** Acha,S. Shah,N., Polak,J. (2017) "Measuring Building Occupancy through ICT Data Streams", European Council for an Energy Efficient Economy Summer Study 2017, Paper 5-412-17, ISBN: 978-91-983878-1-0, May 2017

[3] Kucherenko,S., Abdoussi,F., Hirvoas,A., **Howard,B.** (2016) "Global Sensitivity Analysis of Non-Domestic Buildings Thermal Behaviour", 8th International Conference on Sensitivity Analysis of Model Output, Pages 54-55, Nov 2016

[2] **Howard, B.,** Waite,M., Modi,V. (2014), Impacts on New York GHG Emissions from Distributed Combined Heat and Power, ASME 8th International Conference on Energy Sustainability, ESFuelCell2014-6623, June 2014

[1] **Howard**,B. Modi,V. (2012) Potential for Combined Heat and Power in an Urban Environment, Proceedings of the 6th International ASME Conference on Energy Sustainability, ESFuelCell2012-91452, July 2012

Invited Talks

[17] "Challenges in delivering efficient and flexible electric building energy systems". Smart Electric Energy Lecture Series. School of Engineering and Applied Sciences, Columbia University, Nov 2022

[16] "FlexTECC: Flexible Timing of Energy Consumption in Communities", **Columbia University,** Department of Mechanical Engineering Seminar Series, (Virtual), Oct 2020

[15] "The Pathway to FlexTECC", **Inaugural Fellowship Lecture, Loughborough University**, Online, Sept 2020

[14] "Teaching Collaborative BIM for Design Management with Autodesk BIM360", **Autodesk** Virtual Summer School, Online, Sept 2020 (>100 Participants)

[13] "FlexTECC: Flexible Timing of Energy Consumption in Communities", **Cornell University,** Systems Engineering Seminar Series, Ithaca, New York, USA Dec 2019

[12] "Benefits of Intelligent Aggregation for Demand Response in Electrically heated homes" Energy Systems Catapult, **Powerswarm**, Birmingham, United Kingdom, Oct 2019

[11] "FlexTECC: Flexible Timing of Energy Consumption in Communities", Buildings Research Program, **US National Renewable Energy Laboratory**, Golden, CO, USA July 2019

[10] "Modelling Energy Demands and Greenhouse Gas Emissions in New York City", CI-NERGY Smart Cities with Sustainable Energy Systems Marie Curie Initial Training Network Workshop, **Stuttgart University of Applied Sciences**, Geneva, Switzerland, September 2017

[9] "Future Smart Cities Research and Enterprise Forum", School of Engineering, **London South Bank University**, London, United Kingdom, April 2017

[8] "Harnessing Data for Energy Savings in Facilities Management", **Nebraska Building Environmental and Energy Research Group**, Durham School of Architectural Engineering and Construction, University of Nebraska –Lincoln, NE, USA February 2017

[7] "Advancing Building Intelligence: From Strategic Planning to Systems Operation ", Colloquium on Smart Building Solutions, Department of Mechanical and Process Engineering, Department of Civil, Environmental and Geomatic Engineering, **ETH Zurich**, Zurich, Switzerland, January 2017

[6] "Towards the Next Era of Smart Building Solutions", Energy Futures Lab, **Imperial College London**, London, United Kingdom, October 2016

[5] "Building Scale Combined Heat and Power in New York City: Implications for Greenhouse Gas Emissions", Department of Civil and Environmental Engineering, **University of Texas-Austin**, Austin, TX, USA,February 2015

[4] “Building Integrated Combined Heat and Power Systems: Impacts on New York City”, University of Nebraska –Lincoln, **Durham School of Architectural Engineering and Construction** PhD Symposium, Omaha, Nebraska, USA March 2014

[3] “Importance of Data Visualization**”, International Building Performance and Simulation Association – New York Chapter**, New York, NY,USA November 2013

[2] “Opportunities for District Heating in NYC”, Envisioning Clean Energy Communities: Effective Planning, Education and Partnerships, **International District Energy Association Annual Conference**, Chicago, Il, USA, July 2012

[1] “Thermal Energy in NYC: Implications and Opportunities”, CHP in New York State: The Next Generation, Sponsored by **NYSERDA and NECHPI**, New York, NY, USAJuly 2012