

# IBUILD

GRADUATE RESEARCH FELLOWSHIP

October 7, 2024  
Informational Session



# IBUILD info session agenda

## **Welcome**

Moody Altamimi, *Oak Ridge National Laboratory, Office of Research Education*

## **Why Buildings?**

Amir Roth, *Department of Energy, Building Technologies Office*

## **IBUILD fellowship overview**

Rachel Hill, *Oak Ridge Institute for Science Education*

## **IBUILD fellow spotlight**

Matthew “R.T.” Williams, *Cohort 2, University of Utah*

## **Q&A**

# Welcome from Oak Ridge National Laboratory

Moody Altamimi PhD

*Oak Ridge National Laboratory*

*Office of Research Education*



# Welcome from DOE's Building Technologies Office

**Amir Roth, Ph.D., DOE Technology Manager for Building Energy Modeling (and Building Controls) (and Analysis)**

**October 7, 2024**





# Amir Roth, PhD

Technology Manager for Building Energy Modeling  
Building Technologies Office, U.S. DOE (2010 – present)

Before that: Associate Professor of Computer Science  
University of Pennsylvania (2001 – 2010)

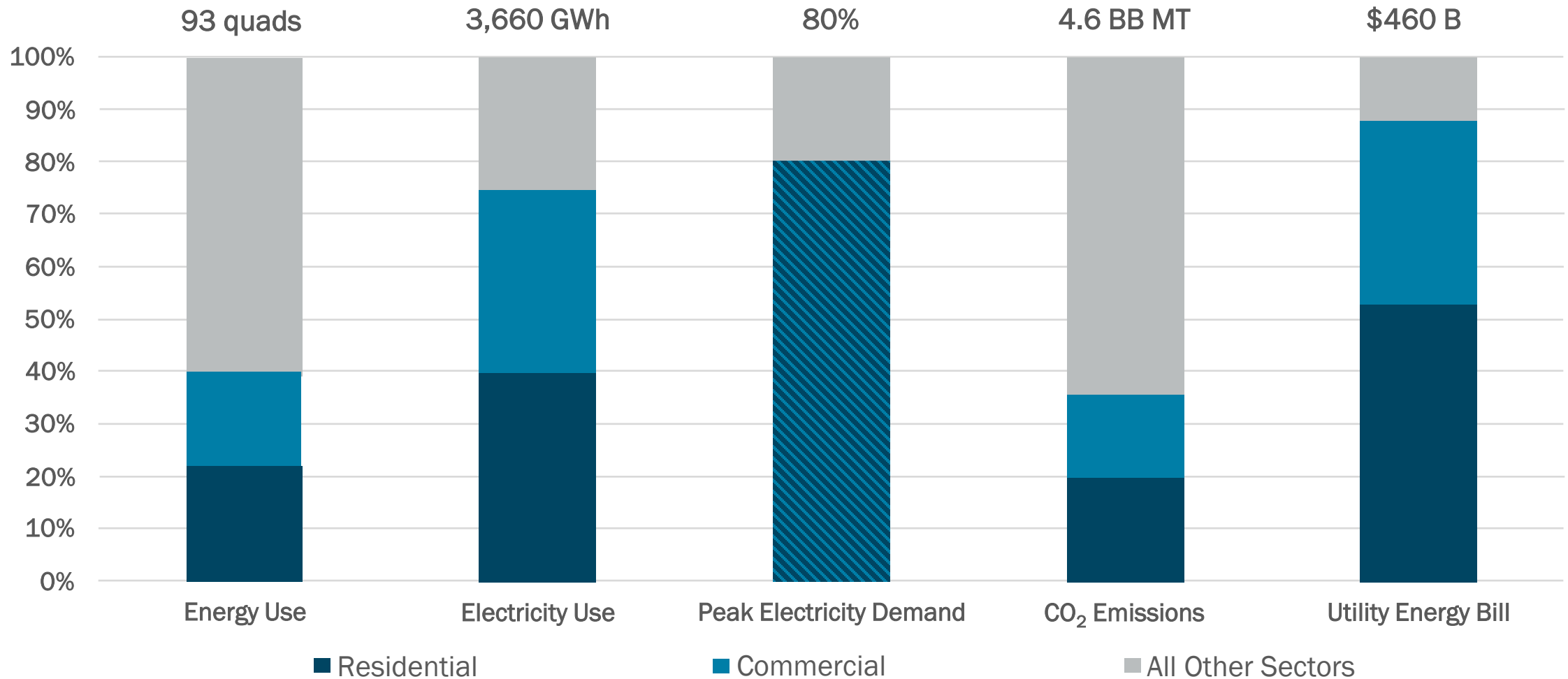
Before that: UW-Madison, Intel, Microsoft, Yale, HS

Hobbies: reading, cross-words, jigsaws, snowboarding,  
woodworking, traveling, Eagles!!

← Non-fur children too old (and cool) for selfies!

[amir.roth@ee.doe.gov](mailto:amir.roth@ee.doe.gov)

# Why Buildings? Largest Sector of the U.S. Energy Economy



BTO is working to achieve a carbon-neutral U.S. building sector by 2050

Sources: US EIA (Monthly Energy Review, Annual Energy Outlook 2021, Electric Power Monthly, Natural Gas Summary)

# More Fun Stats

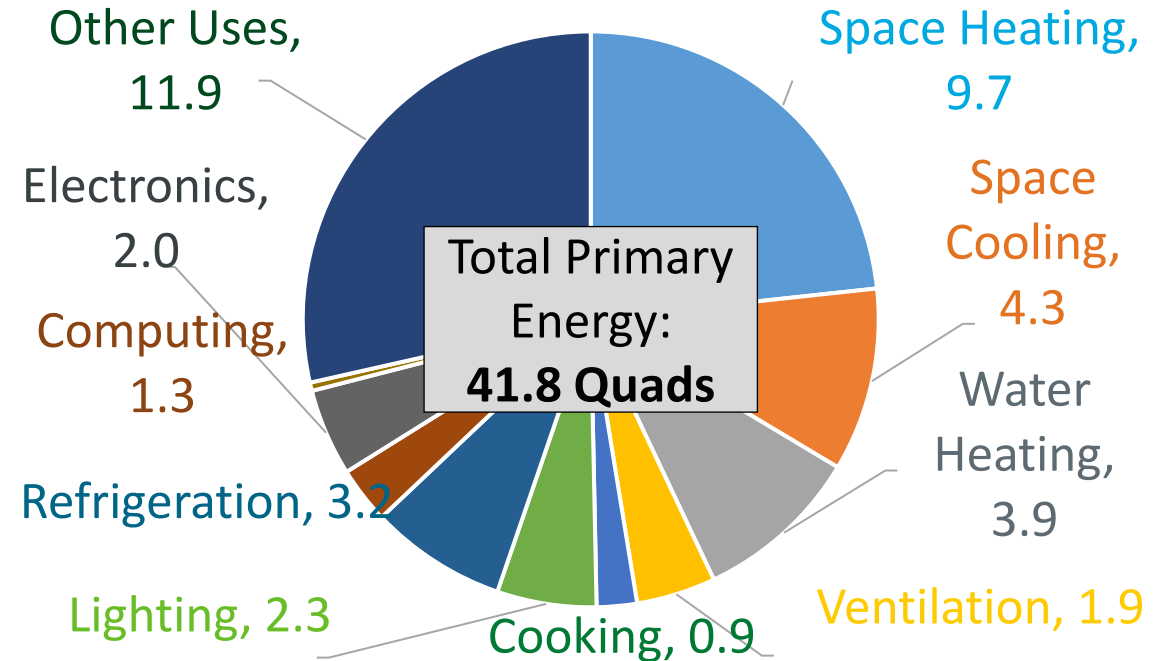


5.9 mn “commercial buildings”  
99 bn ft<sup>2</sup>  
(~1.5 bn new ft<sup>2</sup> / year)  
Service life: 55 years



123 mn “housing units”  
237 bn ft<sup>2</sup>  
(~1.5 mn new units / year)  
Service life: 85 years

## Where does the energy go?



1 “quad” = 293 TWh = 293 bn kWh

Source: EIA Monthly Energy Review; U.S. Energy Information Administration (CBECS 2012/RECS 2015); NAREIT Reits by the Numbers; Harvard University (The State of the Nation's Housing 2020)

# Building Technologies Office (BTO)

“BTO develops, demonstrates, and accelerates the adoption of cost-effective technologies, techniques, tools and services that enable high-performing, energy-efficient and demand-flexible residential and commercial buildings in both the new & existing buildings markets, in support of an equitable transition to a decarbonized energy system by 2050, starting with a decarbonized power sector by 2035.”



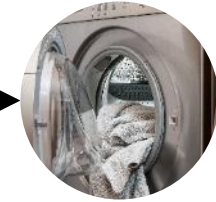
## R&D

- HVAC (heat-pumps!), water-heating & refrigeration
- Envelope and Windows
- Thermal Energy Storage
- Lighting, Appliances & MELS
- Sensors & Controls
- Energy Modeling (best for last)



## Voluntary Mechanisms

- Technology demonstrations
- Technical assistance
- Ratings & recognition programs
- Case studies & best practice guides
- Stakeholder engagement
- Workforce development
- Partnerships



## Codes & Standards

- Equipment standards
- Whole-building model codes
- Technical assistance
- Nation-scale analysis

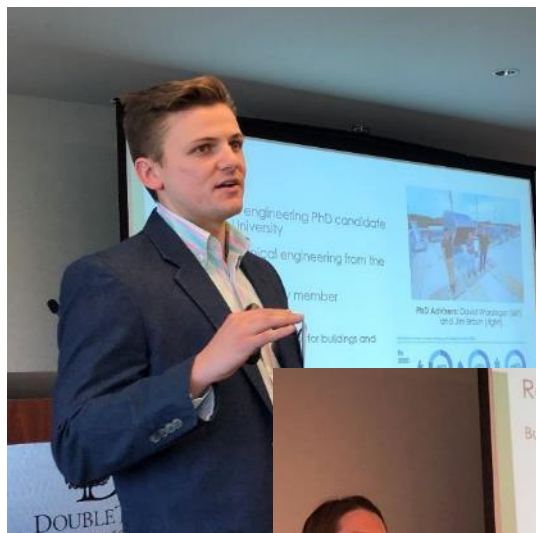


# Recent Emphasis Areas

- **“Decarbonization”** – electrifying gas-based heating, water-heating & cooking
- **Time of use and demand flexibility** – when you use energy as important (or more) as how much you use (want to time use to match renewable generation)
- **Community scale projects** – leveraging shared thermal, electrical, and storage resources; saving energy and demand savings at feeder/substation scale
- **Building Performance Standards (BPS)** – annual code triggers and compliance
- **Embodied carbon** – emissions associated with building materials and processes
- **Advanced construction and retrofit** – has not meaningfully changed in 100 years
- **Occupant health** – not just Covid, CO2, indoor emissions, wildfire smoke, etc.
- **Resilience** – safety & critical services during extreme events & outages
- **Diversity, Equity, and Justice** – benefits, outcomes, and jobs
- **Infrastructure (BIL) and Inflation Reduction (IRA) programs** – technical assistance

# “Annual” Peer Review

- Four-day event in Washington, DC (Crystal City, VA)
- External review of BTO projects by subject matter experts and stakeholders
- Plenaries, panels, and side sessions, including IBUILD session!
- Historically in Apr., but next one is Oct. 21-24, 2024.



# Annual IBUILD Symposium

- Two-plus day event at Oak Ridge National Lab (for now, will rotate in the future)
- Tour facilities, meet researchers, IBUILD staff, and one another!
- Research presentations, panels, plenary talks
- Next one is Jan 16-18, 2025 – try to be there if at all possible!



# IBUILD Fellowship Overview

**Rachel Hill, PhD**

Oak Ridge Institute for Science Education

Associate Manager, STEM-WD



# IBUILD Graduate Research Fellowship overview

- IBUILD (Innovation in Buildings) is a fellowship recruiting its fifth cohort
- Funding innovative building energy efficiency research to prepare future generation of building technology professionals
- Sponsored by DOE **B**uilding **T**echnologies **O**ffice (**BTO**)
  - Provides resources and strategies to significantly reduce building energy use and intensity
- BTO funded research contribute to new technologies
  - Solid-state lighting
  - Energy-saving windows
  - Heat pump water heaters
  - High-efficiency furnaces and air conditioners

# How does IBUILD benefit fellows?

- **Research and educational support** to conduct innovative research at **their home institution** in an area with demonstrated relevance to building energy efficiency
- **Professional development** through experience by delivering oral presentations, writing research papers, and participating in IBUILD webinars
- **Mentoring** to support career exploration
- **Networking** with IBUILD Fellows, mentors, and other building technology researchers
- **Internship** support through funding for travel to internship site

# Who should apply?

- PhD students with at least one year remaining
  - Current undergraduate seniors who will be enrolled by September 1, 2025
- Students with innovative research ideas in an area with demonstrated relevance to building energy efficiency
- Students seeking research career opportunities in building technologies (i.e., national laboratories, industry, academia)

# Benefits

- \$35K stipend
- Up to \$25K tuition reimbursement
- Up to \$12K allowance for travel, materials, and supplies
- Up to \$20K health insurance allowance



# Eligibility overview

- US citizen or permanent US resident
- Intend to enroll or be enrolled full-time in a research-focused PhD program
- Conduct STEM research in an area with demonstrated relevance to building energy efficiency
- Cumulative GPA: 3.0 or higher on 4.0 scale

# Fellowship terms

- Attend IBUILD orientation
- Participate in IBUILD professional development programs
- Present poster at Annual BTO Peer Review and IBUILD symposium
- Submit annual written research report

# Sample fellowship year

- September 1, 2025–August 31, 2026
  - Research at home institution
- October 2025: IBUILD orientation
- October 2025–April 2026
  - Professional development and mentorship opportunities
- April 2026
  - Annual progress reports or request for renewal
- June 2026
  - Independently secured internship with possible travel funding through IBUILD\*

# IBUILD fellowship timeline: Cohort 5

On-line application opens	Now open
<b>Applications due</b>	<b>December 6, 2024 11:59 PM EST</b>
Offer notification	March 2025
Offer acceptance	April 2025
Earliest start date for proposed project periods	July 1, 2025
Latest start date for proposed project periods	September 1, 2025

# What does the application include?

1. Proposed research plan
2. Research summary
3. Research goals and aspirations
4. Diversity statement
5. Résumé
6. Letters of recommendation (2 required)
7. Transcript(s)

# Research Plan

- Describe a problem or issue you would like to research during your graduate studies
  - This could be a description of a current project or new research idea
- The research proposal should include:
  - Background
  - Research methodology
  - Discussion of findings (if relevant)
  - Future directions
  - Broader impacts
- The research proposal should be 2 pages maximum

# Research plan evaluation

- **Broader impacts**

- Does proposed research have potential to benefit society and advance building energy efficiency in support of the [BTO mission?](#)

- **Intellectual merit**

- Does intellectual merit encompass potential to advance knowledge?

- **Scientific and/or technical merit of proposed research**

- Does it demonstrate a clear understanding of challenges involved?
- Is proposed method and approach appropriate?
- Does applicant have access to facilities/resources?

- **Originality and innovation**

- Does proposed research present ideas for cutting-edge technologies or approaches?

# Additional details about fellowship funding

- Health insurance
- Stipend (frequency of payment)
  - Monthly – last business day of month
- Tuition payment (directly to University)
- Materials/supplies/travel
  - Submittal Forms – how to make the funding requests
    - Review and approval process
  - Examples
    - Allowable – conference travel
    - Nonallowable – personal travel
  - If it's not in your PI's budget, it might be in this one! ☺



# More information about IBUILD

- **Website:** <https://ibuildfellowship.ornl.gov/>
  - Visit the **FAQ** page
- **Questions:** [ibuild@orise.ornl.gov](mailto:ibuild@orise.ornl.gov)
- **Apply:** <https://www.zintellect.com/Opportunity/Details/DOE-EERE-RPP-IBUILD-2024>

# IBUILD Fellow Spotlight

**Matthew R.T. Williams**

matthew.r.t.williams@utah.edu

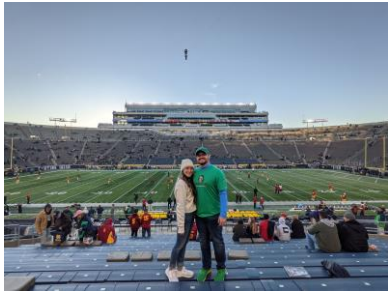
10/7/2024

Powell Research Group, University of Utah



# R.T. Williams

Hometown: South Bend, Indiana



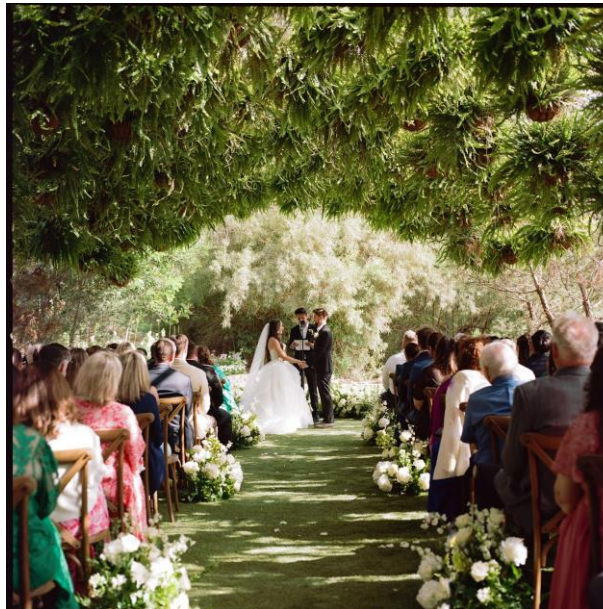
School: University of Utah,  
fourth-year Chemical  
Engineering PhD (third-year  
IBUILD Fellow)



Supervisor: Prof. Kody Powell

Research: Optimizing Housing  
Affordability and Global  
Sustainability in Electrified  
Multifamily Buildings

Hobbies/Interests: Football,  
Outdoor Activities, and Movies



Life Changing Experiences:  
Meeting my partner freshman  
year of undergrad.



# Balancing Two Challenges: Sustainability & Affordability

Cost Burdened Renters in Utah (>30% of Income)

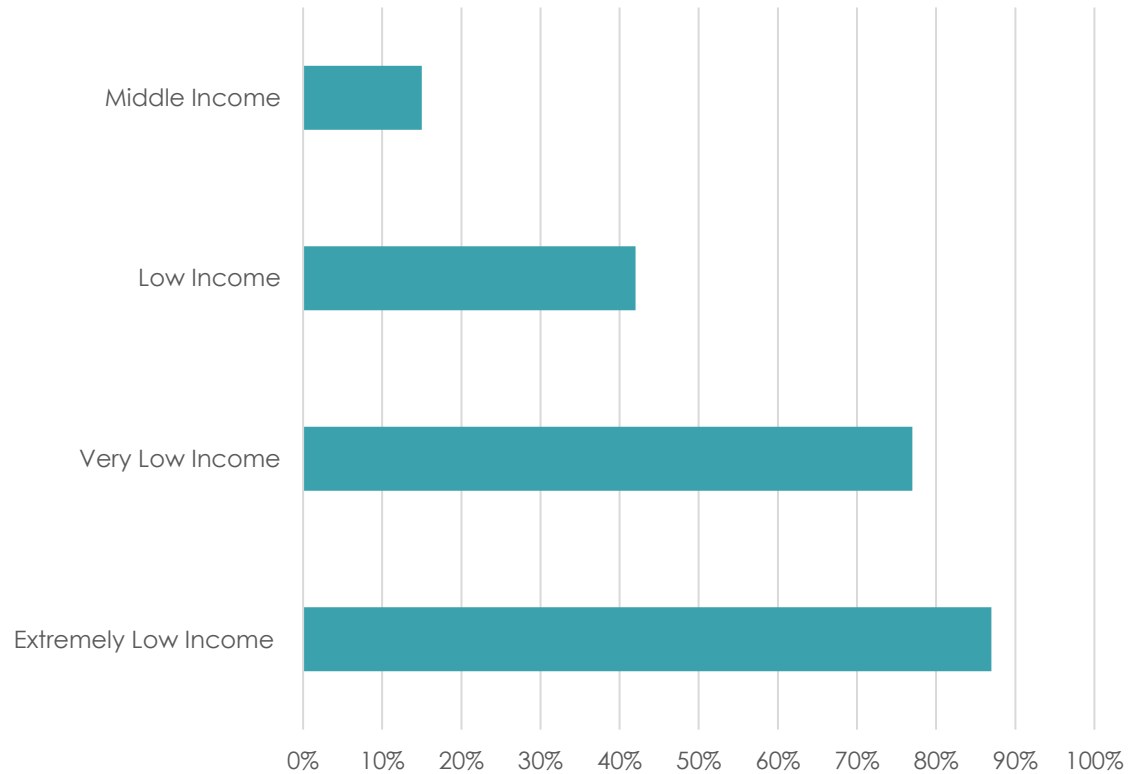


Photo Credit: New York Times

# Electrification as a Potential Solution

- Lower emissions
- Lower costs
- Increase flexibility

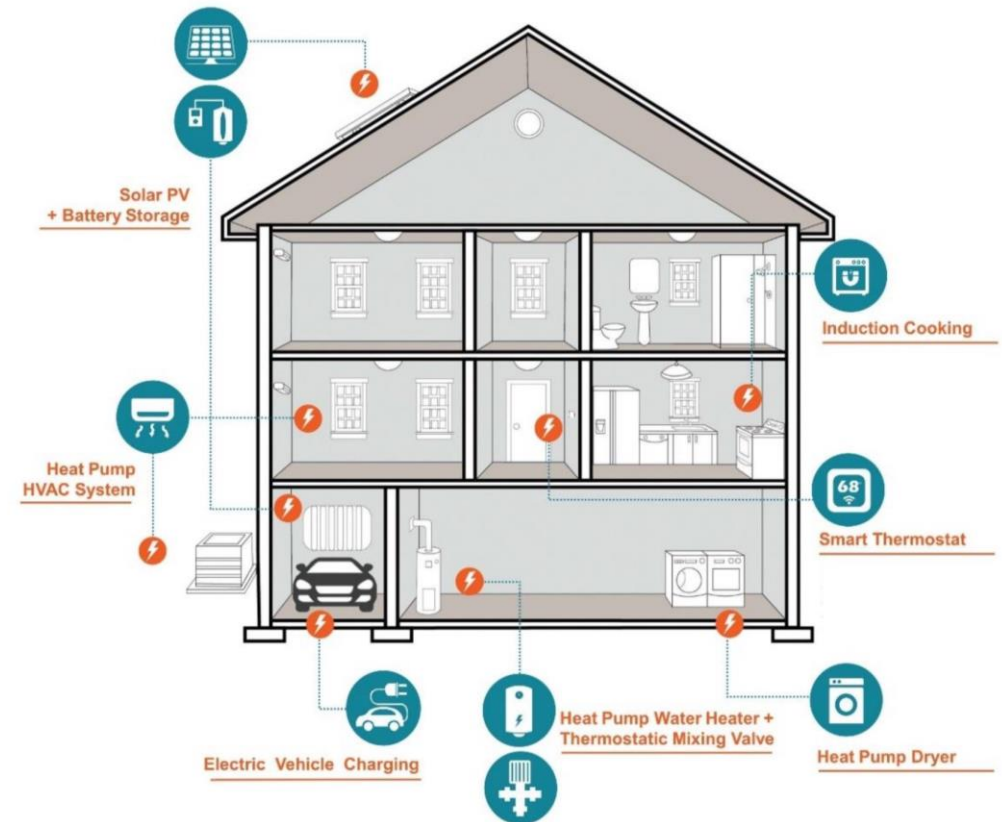
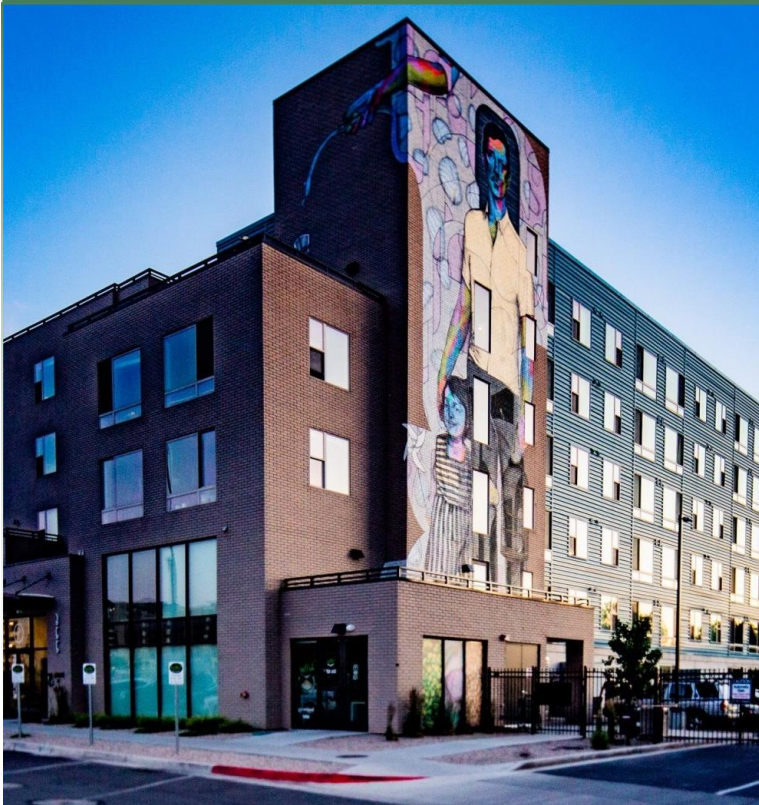


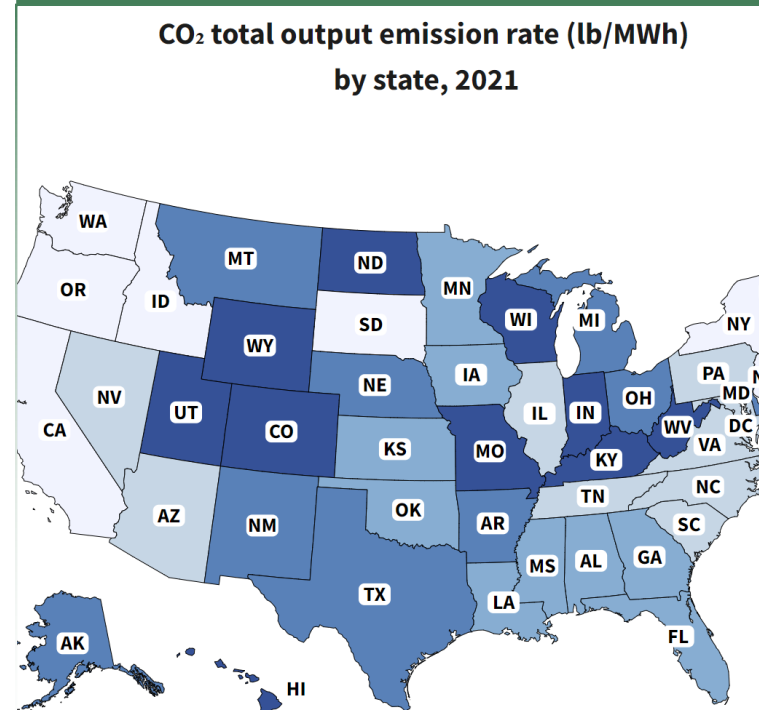
Photo Credit: BuildingGreen

# How do we balance the following in electrification?

## Affordability



## Sustainability

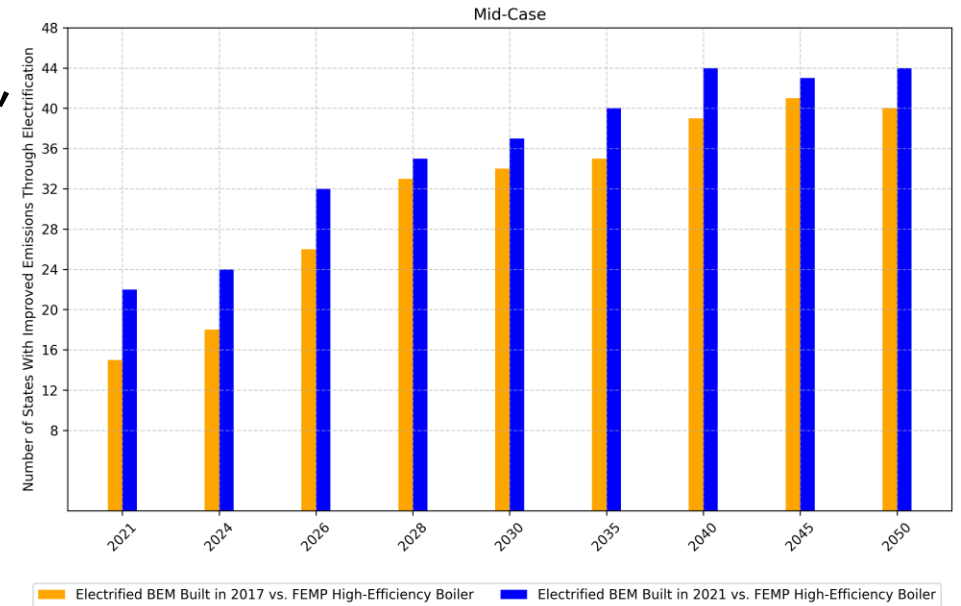


## Smart Grid Opportunities



# Brief Overview of My Work

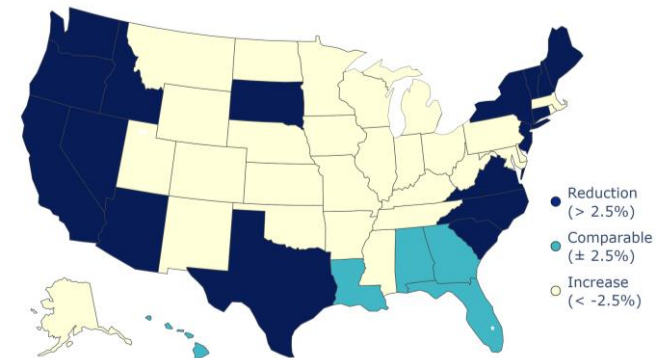
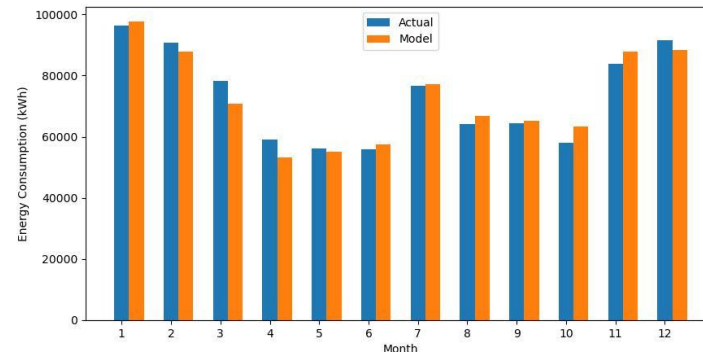
- Building Energy Modeling, Calibration, and Optimization
- Programming (Simple, Machine Learning, etc.)
- Data Analysis
- Economic and Emission Analysis



Project Open



Project Open Digital Twin



# What is Expected of Me? What Support is Provided?

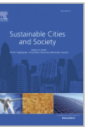
- Publications
- Presentations
- Participation



Digital Chemical Engineering  
Volume 7, June 2023, 100086





Sustainable Cities and Society  
Volume 109, 15 August 2024, 105515





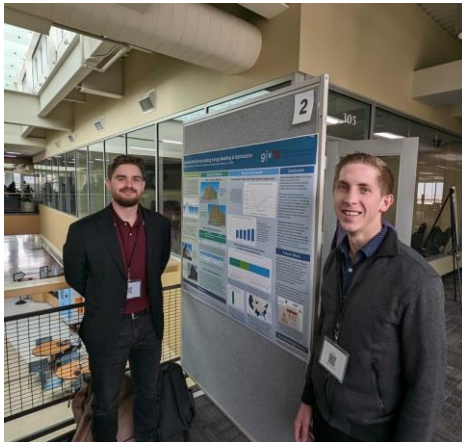
Best practices and methods

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

Matthew R.T. Williams <sup>a</sup>, Michael Reynolds <sup>a</sup>, Chris Parker <sup>b</sup>, Jianli Chen <sup>a</sup>, Kody Powell <sup>a</sup>  

Sustainability and affordability of building electrification: A state-by-state holistic approach for multifamily buildings

Matthew R.T. Williams <sup>a</sup>, Chris Parker <sup>b</sup>, Amanda Dillon <sup>b</sup>, Blake Billings <sup>c</sup>, Kody Powell <sup>a</sup>  





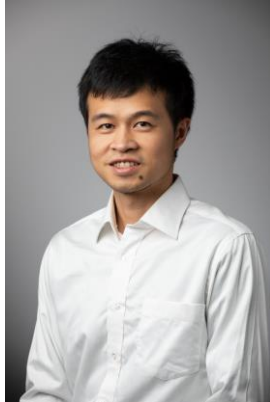
# The IBUILD Program Provides More Support and Opportunities Than You'll Realize



# Acknowledgments & Questions?

## Committee Members

- Prof. Kody Powell
- Prof. Heather Holmes
- Prof. Kevin Whitty
- Prof. Jianli Chen
- Dr. Blake Billings



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# Q&A



# IBUILD

GRADUATE RESEARCH FELLOWSHIP

# IBUILD Program Contacts

- **Amir Roth**, Department of Energy, Building Technologies Office
- **Moody Altamimi**, Oak Ridge National Laboratory, Office of Research Education
- **Rachel Hill**, Oak Ridge Institute for Science Education, STEM Workforce Development
- **James Haynes**, Oak Ridge Institute for Science Education, STEM Workforce Development
- **Jason Schmidt**, Oak Ridge National Laboratory, Building Technologies Research and Integration Center

[ibuild@orise.orau.gov](mailto:ibuild@orise.orau.gov)

General questions? Contact <https://ibuildfellowship.ornl.gov/>