



# **DRIVING TRANSFORMATION**

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# Introducing DOE Building Operators: Grid and Occupants (BOGO) Training

November 14, 2023

Julia Day | Presenter | Washington State University

[more to add here]

Convened by:

# Context and Background

- GEB technologies like smart building automation can dynamically adjust energy consumption, for example by adjusting thermostat setpoint temperatures.



## EFFICIENT

Persistent low energy use minimizes demand on grid resources and infrastructure



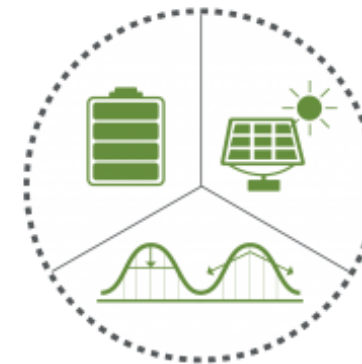
## CONNECTED

Two-way communication with flexible technologies, the grid, and occupants



## SMART

Analytics supported by sensors and controls co-optimize efficiency, flexibility, and occupant preferences



## FLEXIBLE

Flexible loads and distributed generation/storage can be used to reduce, shift, or modulate energy use



# Context

- Such an approach balances energy demand on the grid with low-carbon, available, and affordable energy supply not just by reducing how much energy a building consumes, but by optimizing when energy is consumed.
- However ... GEB technologies and interfaces can also introduce barriers to maintaining occupant comfort, satisfaction, and health, especially if occupants and operators do not understand the systems (or each other).



# Background

- By taking a human-centered approach, our approach invests in sustainable cities of the future with a focus on occupant health, comfort, and satisfaction.
- The program supplements the BOC Fundamentals program, that provides basic principles of energy efficiency awareness and practices in commercial buildings.



# Program Focus

The training program, BOGO (Building Operators: Grid and Occupant Training), is designed to educate building operators on grid-interactive efficient buildings (GEB).

**The BOGO program aims to provide a human-centered approach to training the next generation of building operators using GEB technologies and concepts.**



# Overview

The objective of this project is to develop and demonstrate the value of a formal 14-hour supplemental curriculum to the Building Operators Certification (BOC) Fundamentals program for pre-entry-level building operators that improves their literacy of grid-interactive efficient buildings (GEB) and occupant-centric control (OCC). This building operators' grid and occupant (BOGO) curriculum will accelerate the adoption of GEB and OCC.

*(Period of Performance: 10/01/2021 – 03/31/2025)*



# BOGO Curriculum Includes ...

Lesson Title	Duration: Final
Introduction and Overview	¼ hours
<b>Module 1: Grid-interactive Efficient Buildings</b>	
<b>Lesson 1: Energy versus Power</b>	2 hours
<b>Lesson 2: Buildings and the Electric Grid</b>	2 hours
<b>Module 2: Occupant-centric Building Operation</b>	
<b>Lesson 3: Humans and Buildings</b>	2 hours
<b>Lesson 4: Occupant-centric Building Operation</b>	2 hours
<b>Module 3: Occupant-centric Grid-interactive Building Operation</b>	
<b>Lesson 5: Humans, Buildings, and the Grid</b>	2 hours
<b>Lesson 6: Effective Building Operation</b>	2 hours
Course Review	1 hour
Final Exam	1 hour



# BOGO Curriculum Modules

- **Module 1**

- Grid-interactive Efficient Buildings: Understand the impact of day-to-day operational decisions that operating a grid interactive efficient building have on operational costs, the grid, and the environment.

- **Module 2**

- Occupant-Centric building operation: Know the functionality of occupant centric controls, how they are used to automate building operations, and how energy efficient operations can be impacted by occupants' behavior.





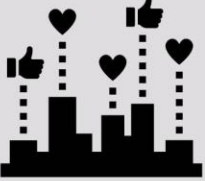
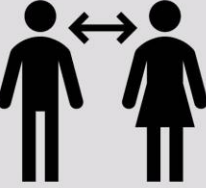
- **Module 3**

- Occupant-centric grid-interactive building operation: Be able to build a common understanding and a culture of collaboration between building operators and occupants to maximize building's energy efficiency and flexibility.

# BOGO Overview

## Building Operators: Grid and Occupants (BOGO) Course Curriculum

Goal: Prepare entry level building operators with a working literacy, and motivation to learn more, of operators' role in grid-interactive efficient buildings (GEB) and occupant-centric building control (OCC).

LESSON 1	LESSON 2	LESSON 3	LESSON 4	LESSON 5	LESSON 6
					
<b>LEARNING OBJECTIVES</b>	<b>LEARNING OBJECTIVES</b>	<b>LEARNING OBJECTIVES</b>	<b>LEARNING OBJECTIVES</b>	<b>LEARNING OBJECTIVES</b>	<b>LEARNING OBJECTIVES</b>
<p>After this class, a building operator should be able to:</p> <ol style="list-style-type: none"><li>1. Differentiate between units and measures of power versus energy.</li><li>2. Explain how regular building operations and maintenance decisions affect a building's energy and power consumption and generation.</li></ol>	<p>After this class, a building operator should be able to:</p> <ol style="list-style-type: none"><li>1. Identify benefits of common commercial building grid-interactive efficient building programs.</li><li>2. Explain how regular building operation decisions affect the electric grid and building finances.</li></ol>	<p>After this class, a building operator should be able to:</p> <ol style="list-style-type: none"><li>1. Identify properties of a building, the HVAC system, and the grid that can limit an operator's ability to provide occupant indoor environmental quality.</li></ol>	<p>After this class, a building operator should be able to:</p> <ol style="list-style-type: none"><li>1. Understand how occupant behaviors can impact the built environment and building energy performance: from occupant, to building, to grid scales.</li></ol>	<p>After this class, a building operator should be able to:</p> <ol style="list-style-type: none"><li>1. Explain how a good relationship between building operators and occupants can help make buildings more efficient and effective GEBs.</li></ol>	<p>After this class, a building operator should be able to:</p> <ol style="list-style-type: none"><li>1. Understand potential strategies for using tenant engagement, communication, and education efforts to enhance occupant behaviors, comfort, and building energy use.</li></ol>

# BOC BOGO Module 1

- **Lesson 1 – Energy versus Power**
  - Differentiate between units and measures of power vs energy
  - Explain how regular building operations and maintenance decisions affect a building's energy and power consumption and generation.
- **Lesson 2 – Buildings and the Electric Grid**
  - Identify benefits of common commercial building grid-interactive efficient building programs
  - Explain how regular building operation decisions affect the electric grid and building finances

# BOC BOGO Module 2

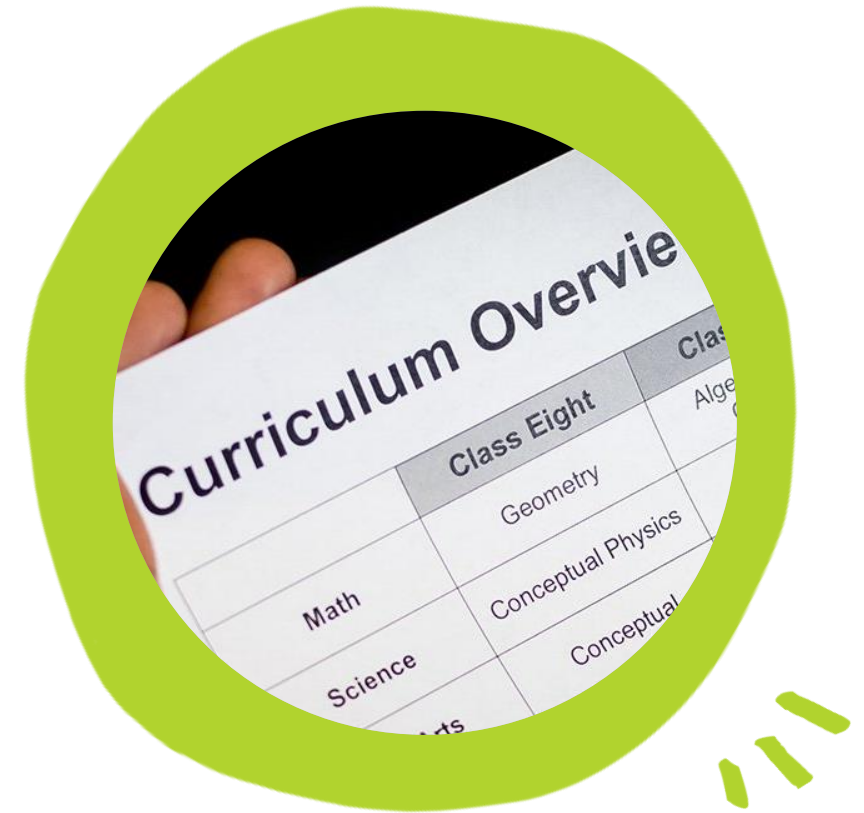
- **Lesson 3 - Humans and Buildings**
  - Identify properties of a building, the HVAC system, and the grid that can limit an operator's ability to provide occupant indoor environmental quality.
- **Lesson 4 - Occupant-centric Control (OCC) & Building Operation**
  - Understand how occupant behaviors can impact the built environment and building energy performance: from occupant, to building, to grid scales.

# BOC BOGO Module 3

- **Lesson 5 - Humans, Buildings, and the Grid**
  - Explain how a good relationship between building operators and occupants can help make buildings more efficient and effective GEBs
- **Lesson 6 - Effective Building Operation**
  - Understand potential strategies for using tenant engagement, communication, and education efforts to enhance occupant behaviors, comfort, and building energy use.

# Lessons Learned

- Challenges faced during the development of the program included creating curriculum applicable to all levels of high school and community college, building a foundation for those with little background in building operations, and utilizing real-world examples.
- The IAB has helped our team focus on key strategies to help our audience and the students.



# Outcomes and Impact

- By taking a human-centered approach, the BOGO project invests in sustainable cities of the future with a focus on occupant health, comfort, and satisfaction.
- The program equips entry-level building operators with the skillset to implement sustainable energy technologies and provides valuable skills for career advancement.
- Additionally, the program will speed the rollout of these technologies, decreasing stress on the electric grid and lowering building carbon emissions.



# Outcomes and Impact

- The BOGO training will be continuously improved through a three-year, 75-student trial before rolling out nationwide in 2025 as a professional credential as part of NEEC's BOC Fundamentals program.
- Currently, NEEC's BOC courses can be taken virtually in all 50 states and Canada. In-person classes are offered in 40 states administered by NEEC and 14 partners.
- Since 1997, NEEC has recorded 21,176 graduates for BOC Level I and 3,766 graduates for BOC Level II. The BOGO curriculum will build on a highly successful training and expand the reach and audience of the BOC program nationwide.

