Agenda

- **10:30-10:45** – Welcome & Introductions
- **10:45-11:45** – Panel Presentations
- **11:45-12:25** – Roundtable Breakout Groups
- **12:25-12:30** – Wrap Up
Recognizing Education Sector Accomplishments and Leadership

Jenah Zweig
Supervisor of Partnerships and Technical Assistance, WIP
Public-Sector Leadership in the Better Buildings Challenge

80+ Partners and over 1 billion square feet

Success!
14 Public-Sector Goal Achievers

DOLLARS SAVED
$686 MILLION

ENERGY SAVED
72 TRILLION BTUS

WATER SAVED
1.49 BILLION GALLONS
# K-12 Schools Accomplishments

**Energy Savings and Program Footprint Continue to Grow**

<table>
<thead>
<tr>
<th>Accomplishments</th>
<th>Total</th>
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<tbody>
<tr>
<td>Number of Partners</td>
<td>30</td>
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<tr>
<td>Approximate Number of Buildings</td>
<td>15,209</td>
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<td>Approximate Number of Square Feet</td>
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**Reported Savings**

<table>
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<tr>
<th>Reported Savings</th>
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<tbody>
<tr>
<td>Cumulative Energy Savings since 2011</td>
<td>3 TBTU</td>
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<tr>
<td>Cumulative Cost Savings</td>
<td>$25 M</td>
</tr>
<tr>
<td>Average Annual Energy Intensity Improvement Rate</td>
<td>2%</td>
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</table>

**Goal Achievers**

20%+ Reduction in Energy Use Intensity
Zero Energy Schools Accelerator

Launched by DOE in the fall of 2016 as a targeted, three-year effort to identify, develop, and share strategies to overcoming barriers to achieving ZE schools.
### Higher Education Highlights

#### Goal Achievers

20%+ Reduction in Energy Use Intensity

**UC Irvine**

#### Smart Labs Accelerator

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<table>
<thead>
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<td>Number of Challenge Partners</td>
<td>19</td>
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<tr>
<td>Approximate Number of Square Feet</td>
<td>380 M</td>
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**Reported Savings**

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>Cumulative Energy Savings since 2011</td>
<td>14 TBTU</td>
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<tr>
<td>Cumulative Cost Savings</td>
<td>$130 M</td>
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</table>
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- 12:25-12:30 – Wrap Up
Panel Presenters

- **Michael Myer, PNNL**: K-12 Lighting Toolkit
- **Theresa Spurling-Wood, Alachua County Public Schools, FL**: Workforce Apprenticeship Programs
- **Brendan Hall, EPA**: ENERGY STAR Resources
- **Paul Torcellini, NREL**: Zero Energy K-12 School Districts
K-12 Lighting Toolkit
Michael Myer
K-12 LIGHTING TOOLKIT

K-12 schools can save up to 50% on energy use if they optimize their lighting equipment and operations.[1] School equipment replacement and operating costs drive the decision-making for infrastructure investments. Lighting is one of those investments where the ROI is attractive and visible, often the first step in major school energy efficiency upgrades. Nationally, schools have reduced lighting energy consumption by an average of 5% from 2003-2012 according to the Commercial Buildings Energy Consumption Surveys.[2] Many of these upgrades include lighting retrofits to highly-efficient light-emitting diode (LED) technology. There are additional energy and cost savings opportunities with new lighting technologies, controls, and design considerations.

This toolkit covers a wide range of technical implementation details, case studies, specifications, and more on lighting technologies in K-12 schools. There are resources on new technologies for the classroom like tunable lighting and adaptive controls for parking lot lighting. Other resources cover various interior and exterior spaces like auditoriums, cafeterias, gymnasiums, and pedestrian walkways. Leveraging these outstanding results and strategies, the K-12 Lighting Toolkit provides some best practices for implementing energy-efficient lighting in schools.
K-12 Toolkit | Resources

Design Guides

- Design considerations
- Guidance for specific applications
- Tailored solutions/approaches

Case Studies

- Highlight actual projects
- How other schools approached challenges
- Specific Solutions
FACT SHEET: Upgrading troffer luminaires to LED

### Introduction

Three primary LED options exist for upgrading lighting systems that use fluorescent troffers: replacing the fluorescent lamps with LED replacement lamps, replacing the fluorescent lamps and other luminaires components with an LED retrofit kit, and replacing the fluorescent luminaires with new luminaires designed with LED technology. Selecting the best option for an individual building situation involves evaluating the energy and performance benefits associated with the investment, but also taking into account the condition of the fluorescent troffer luminaires, the desired luminous properties of the upgraded lighting system, the accessibility of the ceiling plenums, and the initial and ongoing economic goals for the upgrade. This fact sheet provides guidance on the different options for selecting an LED upgrade for a fluorescent system.

### System Factors to Consider

An evaluation of LED upgrade options includes assessing the system costs and the effects on the lighting system performance. Table 1 summarizes a number of the key factors, and helps break down the costs associated with the LED upgrade. The initial costs are for the LED retrofit kits, and the operating costs are for the LED luminaires. Each of the three LED upgrade options, the table provides a color-coded distribution of whether a factor is favorable for the replaced LED system (green), neutral (yellow), or unfavorable for the replaced LED system (red). Factors may be green, yellow, or red for a number of reasons, but it is the overall effect that matters in evaluating the cost/benefit for the LED upgrade option.

#### Initial Costs

- **Equipment purchase costs**
- **Installation labor costs**
- **Safety certification costs**

#### Operating costs

- **Energy costs for equal light output**
- **Replacement costs over system life**

#### Current light levels

- **Acceptable; should not be reduced at all**
- **Reductions of 10% or more are okay**

#### Dimming required

- **No, dimming is not required**
- **Yes, dimming is required**

---

Table 1. System factors to consider for LED upgrades.
Why use tunable LED systems?

- Biophilic
- Control
- Circadian
- Matching
- Behavioral cues
- Preferences
- Atmosphere
- Alertness
K-12 Toolkit | Carrollton-Farmers Branch Schools (Tunable Lighting)

4200K
3000K
3500K
5000K

1: FULL – All 100%
2: AV – Front Off, Room 40%
3: PRESENT – Front 100%, Room 60%
4: ALL Dim 10%

UP / DOWN – Change all by 5% each click
Energy use for lighting during a typical day
Summary

- LED lighting systems can offer significant energy and economic benefits to schools
- Dimming & scene control of LED lighting can produce even deeper savings
- Tuning the spectrum of LED lighting may offer further benefits
  - Not more energy savings (non-energy benefits or NEB)
  - Gives teachers more control of classroom environment
  - Provides visual cues for desired student behaviors
  - Allows for “future proofing” to adapt to emerging science on alertness and focus
Additional Resources

To access the new K-12 Lighting Toolkit:
- https://betterbuildingssolutioncenter.energy.gov

FACT SHEET: Upgrading troffer luminaires to LED:
- https://www.energy.gov/eere/ssl/technology-fact-sheets

GATEWAY Evaluation Reports
- https://www.energy.gov/eere/ssl/gateway-evaluations

Interior Lighting Campaign
- https://interiorlightingcampaign.org/

Michael Myer
Michael.myer@pnnl.gov
509-375-7292
Workforce Apprenticeship Programs
Theresa Spurling-Wood, CEM, CIE, GGP, LEED AP
Director, Energy Systems - Alachua County Public Schools
Apprenticeship is the first step
Heating and Air Conditioning Apprenticeship, Certificate

Degree Audit

00000000

Advisement Track:
VC 7601 -
Catalog Year: 2019

This advisement assumes successful completion of current term work.

PROFESSIONAL CORE
Hours Required: 1350.0  Earned: 0.0  Enrolled: 0.0  Needed: 1350.0

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Grow your own Instructors/Mentors
North America’s Building Trades Unions (NABTU)
Apprenticeship Readiness Programs (ARPs) PREPARING FOR THE BUILDING TRADE

North America’s Building Trades Unions (NABTU) sponsors comprehensive apprenticeship readiness programs (ARPs) throughout the U.S. These programs provide a gateway for local residents – focusing on women, people of color, and transitioning veterans – to gain access to Building Trades’ registered apprenticeship programs. ARPs are administered by state and local Building Trades Councils and they teach NABTU’s nationally recognized Multi-Craft Core Curriculum (MC3).
NABTU is committed to training and workforce development in the construction industry, as demonstrated through our investment in registered apprenticeship. Through our 1,900 training centers across the United States and Canada, we train 71 percent of all construction apprentices.
Instructors make the difference
Association of Energy Engineers (AEE)
The Association of Energy Engineers certifies that

Theresa A. Spurling-Wood

has completed the prescribed standards for certification, has demonstrated a high level of competence and ethical fitness for energy management, and is hereby granted the title of

CERTIFIED ENERGY MANAGER®

Valid
January 1, 2019 to December 31, 2021
CEM
22724

[Seal]

[Signature]
[Signature]
FEMP Training Curriculums

The Federal Energy Management Program’s (FEMP) training curriculums help agencies gain a full understanding of key energy management areas. Continuing education units (CEUs) from the International Association for Continuing Education and Training (iACET) are awarded upon successful completion of each course and accompanying assessment and evaluation.

FEMP training is accessible through the Whole Building Design Guide (WBDG) learning management system, which allows students to launch and track their training activity. Log in to the WBDG.

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<th>Distributed Energy and Energy Procurement</th>
<th>Operations and Maintenance</th>
<th>Energy and Cyber Security Integration</th>
<th>Portfolio Resilience Planning and Integration</th>
<th>E3PC, UC3C, and Appropriations Project Development</th>
<th>Product Efficiency and Technology Integration</th>
<th>Facility and Fleet Optimized Design</th>
<th>Strategic Integration Planning</th>
<th>Legislative and Mandate Guidance</th>
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US Green Building Council (USGBC)
Center for Green Schools
USGBC Center for Green Schools

Theresa Spurling-Wood

HAS ACHIEVED THE DESIGNATION OF
GREEN CLASSROOM PROFESSIONAL

BY DEMONSTRATING THE KNOWLEDGE AND UNDERSTANDING OF GREEN CLASSROOM PRACTICES AND
PRINCIPLES NEEDED TO CREATE HEALTHIER, MORE ENVIRONMENTALLY RESPONSIBLE PLACES TO
WORK AND TEACH.

R. M. Phillips
President & CEO
U.S. Green Building Council

Theresa Spurling-Wood

GREEN BUILDING CERTIFICATION INSTITUTE

HAS ACHIEVED THE DESIGNATION OF
LEED® ACCREDITED PROFESSIONAL

BY DEMONSTRATING THE KNOWLEDGE OF GREEN BUILDING PRACTICE
REQUIRED FOR SUCCESSFUL IMPLEMENTATION OF THE LEADERSHIP IN ENERGY
AND ENVIRONMENTAL DESIGN (LEED®-EB) GREEN BUILDING RATING SYSTEM®.

June 17, 2009

[Signature]
Arc supports schools, educators and students

Arc is pleased to partner with USGBC’s Center for Green Schools to provide data-driven tools for K-12 teachers, students, school facility staff and district managers, and support high-quality, relevant environmental and sustainability education.

By tracking green building performance, students can understand how green buildings impact their health and the environment, increase their sustainability literacy and find new ways to help reduce their school’s negative environmental impacts. Whether for a single school building or entire district, tracking green building performance helps you:

• Establish, track, and communicate sustainability goals;
• Identify areas for improvement;
• Engage students in data collection and analysis;
• Prepare for green building certification.
• Much more!

Arc turn schools into living laboratory where students can learn about science, technology, and mathematics concepts and collect, analyze, and score data about their school building.
FEMP Training Curriculums
North America’s Building Trades Unions (NABTU)

AEE U.S. CEM® & CEA® Programs ANSI Accredited and Recognized by DOE

https://www.sfcollege.edu/construction/apprenticeship-programs/index

USGBC Center for Green Schools Arc for schools
ENERGY STAR for Higher Ed buildings

Brendan Hall
Higher Ed Lead, ENERGY STAR Buildings
The core of ENERGY STAR Buildings

- **ENERGY STAR Portfolio Manager**
  - Assess a building’s energy use, water use, and waste and materials performance
  - Free, online, secure
  - Any type of building can be benchmarked
  - Target improvement efforts on the lowest performers in your portfolio

- **1-100 ENERGY STAR Score**
  - Compares your building’s performance against similar buildings nationwide
  - Available for many types of properties, including some found at colleges and universities
  - Typically requires building-level metering for all energy sources

- **ENERGY STAR Certification**
  - Scores of 75 or higher indicate possibility for ENERGY STAR certification
Tools and resources for colleges and universities

- **Portfolio Manager**
  - AASHE STARS through ENERGY STAR guide + reporting template
- **Free, three-unit curriculum**
- **Competition-hosting resources**
- **Treasure Hunt resources**
  - Campaign for October implementation
  - Labs, Offices, Student Housing (in development), Other
- **ENERGY STAR Partner of the Year Awards**
  - Northwestern University, 2018 & 2019 ENERGY STAR Partner of the Year – Energy Management

Higher ed landing page: energystar.gov/HigherEd
Peer-to-Peer Roundtable

- First session was June 24th. At least two additional sessions to come.
- Goals
  - Peer sharing on efficiency strategies
  - Identification of efficiency barriers
  - Ideas for what ENERGY STAR could do to better support efficiency adoption
- Format
  - Moderated discussions
  - Presentations from colleges and universities
  - Possible peer comparison among participating schools facilitated by EPA

Please contact me if you’d like to participate: hall.brendan@epa.gov
Contact info

- Make a commitment to save energy, save money, and protect the environment by joining ENERGY STAR as a partner: [www.energystar.gov/JoinBuildings](http://www.energystar.gov/JoinBuildings)
- Webinar August 6 hosted by AASHE: “Step Away from the Spreadsheet: Online Tools are Making Sustainability Management in Higher Education Easy”
- AASHE Conference & Expo October 27-30, Spokane, WA
- Reach out to discuss your approach to energy management, discuss opportunities, and share best practices with peers.

Brendan Hall
Higher Ed Lead, ENERGY STAR Buildings
hall.brendan@epa.gov
202-343-9939
Resources for the Education Sector
Paul A. Torcellini, Ph.D., P.E.
Principal Engineer, National Renewable Energy Laboratory
Engage with the Technology Research Teams

Plug and Process Loads Team
- Covers best practices and innovative technologies for controlling these loads in commercial buildings. PPLs are expected to increase with respect to the other building end use energy loads, and now is a great time to get involved.
- Lead: Kim Trenbath: kim.trenbath@nrel.gov

Envelope Tech Research Team
- Air infiltration accounts for 20% of primary energy consumption in buildings. Learn more about advanced window, wall, and roof technologies to improve your building enclosure.
- Lead: Melissa Lapsa: lapsamv@ornl.gov

Smart Energy Analytics Campaign
- Look for Eliot Crowe to talk about the Energy Information System (EIS) or Fault Detection and Diagnostics (FDD) tools you have implemented in your buildings, and how you can get started with a monitoring-based commissioning process.
- Lead: Eliot Crowe**: ecrowe@lbl.gov

Contact your Account Manager for Introductions!

**These staff are at the Summit. Find them at ask-an-expert tables during networking breaks.
Engage with the Technology Research Teams

**Interior Lighting Campaign**
- Facility owners and managers can receive guidance and recognition for lighting upgrade or new installation of high efficiency interior lighting solutions.
- **Lead: Michael Myer**: Michael.Myer@pnnl.gov

**Space Conditioning Team**
- Commercial HVAC accounts for about 40% of total commercial energy use in the US. Through the Space Conditioning Technology Research Team, partners work to deploy energy-saving space-conditioning strategies by partnering with industry, coordinating real world building demonstrations, and generating tools.
- **Lead: Miles Hayes**: Miles.Hayes@nrel.gov

**IoT Lighting Challenge**
- Facility owners and managers can help define the performance characteristics of a competitively priced new-to-market light fixture that will be easily upgradable to provide for internet connectivity. Connect to learn more or participate in the IoT Lighting Challenge.
- **Lead: Michael Myer**: Michael.Myer@pnnl.gov

**Contact your Account Manager for Introductions!**

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**These staff are at the Summit. Find them at ask-an-expert tables during networking breaks.**
Advanced Energy Design Guides Background

Six 30% Guides published
(2004-2008)
Highway Lodging, K-12 Schools, Small Hospitals and
Healthcare Facilities, Small Office Buildings, Small Retail
Buildings, Small Warehouses and Self Storage

Five 50% Guides published
(2009-2013)
Grocery Stores, K-12 Schools, Large Hospitals, Small to
Medium Office Buildings, Medium to Big Box Retail
Buildings

Two Zero Energy
Guides Published
(2018-current)
K-12 Schools
Offices
Multifamily (in development)

As of June 24, 2018
All versions (June 3, 2019)
629,456 downloaded
26,432 distributed in print
655,888 total
153,601 registrants account for free
AEDG downloads

• Industry partnership with top professional organizations and DOE, with
oversight and constant validation process with industry experts
• Specialized volunteer experts on the Project Committee for each guide,
representing the different professional organizations
• Supported by and leveraging DOE’s national laboratory research, energy
simulation, and technical analysis
Energy Use Intensity Targets

Did exhaustive simulations to determine energy use intensity targets
- Can show that zero is possible and the types of strategies that can be used to get there

Set of design decisions that can achieve the targets
- Zero Energy Ready Buildings—buildings so efficient that on-site renewables can offset the energy needs
Background

Educational guidance—not a code; not a standard; not a guideline

- Intended audience are owners, architects, and engineers looking for beyond code guidance for implementing energy efficiency strategies

Available for free as a PDF download from www.ashrae.org/aedg

Developed by professional experts appointed by sponsoring organizations
School ZER Simulations

![Graph showing EUI (kBtu/ft²·yr) for different climate zones.](image)

- **Primary School Site EUI**
- **Secondary School Site EUI**
What is in the Guide?

Chapter 1 – Introduction
Chapter 2 – Rationale for Zero Energy
Chapter 3 – Keys to Success
Chapter 4 – Building Simulation
Chapter 5 – How to Strategies

Dearing Elem. School EUI=23.5
Discovery Elem. School EUI=15.8
Friends School EUI=11.7
Chapter 5: How-to Strategies

Table showing how the strategies can be applied

Collection of small pieces of text with strategies to help move towards zero.

- Building and Site Planning
- Envelope
- Lighting (daylighting and electric lighting)
- Plug Loads and Power Distribution
- Kitchen Equipment
- Service Water Heating
- HVAC Systems
- Renewable Energy
Just Released

- AEDG for Zero Energy Small to Medium Office Buildings
  - Energy Targets for ZE office buildings
  - [www.ashrae.org/aedg](http://www.ashrae.org/aedg)
New Document

• Created by the Zero Energy Schools Accelerator
• Designed for Owners providing steps to achieve success in zero energy schools.
• Coming Soon!
Join us! Better Buildings Alliance Renewables Integration Team Buildings-to-Grid Working Group

FOCUS AREAS:
- Strategic integration of renewables
- Energy storage
- Building load flexibility
- Grid coordination

- Bimonthly, 1-hour conference calls
- Kick-off meeting in early August
- Also looking for participants for two studies:
  - **Portfolio analysis**: understand potential for load flexibility (optimized demand management)
  - **Field study**: implementing building load flexibility solutions

Interested? Email us!
Rois Langner: Rois.Langner@NREL.gov
Selam Haile: Selam.Haile@NREL.gov
Zero Energy Activity Assessment

- Is your firm interested in developing, acquiring, or pursuing Zero Energy Buildings? Why or why not?
  - What are the perceived barriers or benefits?
- Do you have active or existing Zero Energy projects?
- Are you planning to pursue Zero Energy buildings in the next 2-3 years?
  - What is the anticipated timeline or completion date of the project?
Mid-rise multifamily AEDG (Completion August 2020)

Combination of these guides well suited to many campus applications

Idea is to set energy goals and procure buildings to meet these goals at little or no additional cost.

Contact: paul.torcellini@nrel.gov
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Roundtable Breakout Groups

- **Solar Decathlon**: Holly Carr, DOE
- **Smart Labs**: Rachel Shepherd, DOE
- **Rural Schools Guide**: Liz Doris, NREL
- **USGBC Green Schools Current Engagement Activities**: Anisa Heming & Phoebe Beierle, USGBC Center for Green Schools
- **Portfolio Manager Training Resources**: Brendan Hall, EPA
- **Zero Energy Schools**: Paul Torcellini, NREL
- **Workforce Retention Programs**: Maddy Salzman, DOE
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Summit Welcome and Partner Recognition

AnnaMaria Garcia
Director, Weatherization and Intergovernmental Programs
Thank You

Provide feedback on this session in the Summit App!

Download the app to your mobile device or go to event.crowdcompass.com/bbsummit19