Getting to Zero Energy in Schools is Achievable!
Showcasing Successful Zero Energy School Projects from Around the U.S.
May 28, 2020

New Buildings Institute
Driving energy and carbon emissions reductions in the built environment.
Program areas include:
1. Advanced buildings
2. Getting to zero leadership
3. Code and policy innovation
Learning Objectives

1. Participants will understand how key zero energy building concepts and strategies are implemented through successful case studies of school projects.

2. Participants will learn definitions, policies and main drivers that have contributed to the evolution of zero energy and challenges associated with zero net energy projects.

3. Participants will learn how zero energy schools should be planned and optimized across the whole district and how to anticipate and overcome the invariable challenges and hurdles on the path to zero.

4. Participants will learn how zero energy school retrofits and new construction should be coordinated into an integrated design process to optimize building performance, student/teacher performance, and lifecycle cost.

Getting to Zero in Schools
Getting to Zero in Schools

• Delivers cost avoidance from utility bills to classroom and facilities
• Creates comfortable and productive environment
• Provides hands-on, 21st century learning opportunities
• Results in stronger, more resilient communities

Getting to Zero Over Time

• Long term, strategic approach to energy management
• Set measurable goals and regularly report on progress
• Leverage every opportunity to improve energy performance
• Focus on the benefits to the learning environment
Set Overarching Goals

- Measureable energy reduction, renewable energy and carbon emission reduction goals. Examples:
  - Reduce consumption by 50% below 2000 baseline by 2030
  - Eliminate combustion of natural gas by 2040
  - Generate 100% of power needs by 2030
  - Achieve an average portfolio site EUI of 25 kBtu/sf-year by 2030

The Getting to Zero Over Time Process

- Identify the zero hero to champion the zero goal
- Benchmark facilities
- Use energy as core area in facility assessments and master planning process
- Find synergies with current projects
- Identify and capitalize on low-hanging fruit
- Align with building lifecycle events
- Incorporate energy into policy guidance documents
- Regularly report on progress
Today’s Presenters

Mike Wilson
Director of Facilities | Warren County Public Schools

Kate Bubriski
Director of Sustainability & Building Performance | Arrowstreet

THE WARREN COUNTY SCHOOLS NET ZERO STORY
Alvaton Elementary

Opened 2006

79,518 Gross square feet

750 Student capacity
Bristow Elementary

Opened 2010

79,518 Gross square feet

750 student capacity
RICHARDSVILLE ELEMENTARY - NATION’S FIRST NET ZERO ENERGY SCHOOL

Richardsville Elementary

Opened 2010

72,285 Gross square feet

550 Student capacity
South Warren High School & Middle School

High School Opened 2010
334,000 Gross square feet - total
1,250 Student capacity

Middle School Opened 2010
750 Student capacity

The largest K-12 building in the state of Kentucky
JODY RICHARDS ELEMENTARY

Opened 2011
80,904 Gross square feet
750 Student capacity

Jody Richards Elementary
JENNINGS CREEK ELEMENTARY - 2ND NET ZERO ENERGY SCHOOL

Jennings Creek Elementary

Opened 2018

87,000 Gross square feet

750 Student capacity
### NUMBERS

<table>
<thead>
<tr>
<th>School</th>
<th>Square Footage</th>
<th>Electric Usage in kWh-last 12 mos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alvaton</td>
<td>79,518 sq. ft.</td>
<td>605,200</td>
</tr>
<tr>
<td>Bristow</td>
<td>79,518 sq. ft.</td>
<td>519,600</td>
</tr>
<tr>
<td>Richardsville</td>
<td>72,285 sq. ft.</td>
<td>396,288</td>
</tr>
<tr>
<td>Jody Richards</td>
<td>80,904 sq. ft.</td>
<td>482,200</td>
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### NUMBERS CONT.

<table>
<thead>
<tr>
<th>School</th>
<th>Square Footage</th>
<th>Electric Usage in kWh-last 12 mos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briarwood</td>
<td>79,727 sq. ft.</td>
<td>575,400</td>
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<tr>
<td>Plano</td>
<td>73,558 sq. ft.</td>
<td>548,450</td>
</tr>
<tr>
<td>Lost River</td>
<td>69,824 sq. ft.</td>
<td>546,096</td>
</tr>
<tr>
<td>Warren Elem.</td>
<td>66,670 sq. ft.</td>
<td>562,884</td>
</tr>
</tbody>
</table>
SIDE BY SIDE COMPARISON

ICF School Average Monthly Electric Usage versus Non-ICF Average

500,822 kWh versus 558,207 kWh

THANK YOU!

MIKE WILSON
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King Open / Cambridge St Upper School & Community Complex

May 28, 2020

NBI WEBINAR - ZERO ENERGY SCHOOLS ARE ACHIEVABLE

COMMUNITY AMENITY
EQUITY & INCLUSION
HEALTHY ENVIRONMENT
LEARNING CENTERED
NET ZERO EMISSIONS
LEED v4 PLATINUM
100% WATER REDUCTION
RED LIST FREE MATERIALS

PROJECT OVERVIEW
926 STUDENTS
PK-8 GRADES
273,000 GSF
4 STORIES
476 3/5\+
2019 OPENED
NET ZERO EMISSIONS DEFINITION

An all-electric building, that has a very low EUI, whose annual energy use is equal or less than the amount of newly constructed on-site or off-site renewable energy.
ENCLOSURE

40% WWR
R-28 WALLS
R-40 ROOF
U-0.35 FIXED GLAZING
U-0.48 OPERABLE
SYSTEM HIGHLIGHTS

Ground Source Heat Pumps
-190 geothermal wells

Radiant Heating & Cooling

Displacement Ventilation

Heat Recovery

Demand Control

LED Lighting

Daylight Controls

On Demand Hot Water

PATH TO NET ZERO EMISSIONS
**ENGAGEMENT PROCESS**

- **Plan**
- **Educate**
- **Know, Ask, Listen**
- **Respond**
- **Prioritize**
- **Repeat**

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**ENGAGEMENT PLAN**

- **Feasibility Phase**
  - Define goals
  - User meetings with all groups
  - Collect usage data (schedules, equipment, etc.)

- **Schematic Design**
  - Build consensus on goals
  - Establish NZE Champions Group
  - NZE Champions Workshop

- **Design Development & CDs**
  - Meet with NZE Champions group in each phase to discuss design as it develops

- **Construction**
  - Workshop with all staff and students
  - Start to get used to what to expect
  - Training before move-in

- **Post Occupancy**
  - Operations Manual: user cards, phone app
  - Curriculum incorporation
  - Yearly training
ENGAGEMENT TOOLS

ENGAGEMENT LEADS TO ENERGY REDUCTION - 13.6%
PROJECT TEAM

Client: City of Cambridge
Architects: William Rawn Associates, Architects
           Arrowstreet Architecture & Design
MEP/AV Engineer: Garcia, Galaska & DeSouza
Energy Consultant: In Posse
Structural Engineer: Liddell, Kneer, Conklin, Ingalls & Eister
Civil Engineer: Witt Engineering
Landscape: Copley Wolff Design Group
LEED Consultant: Soden Sustainability
Acoustics / AV: Acentech
Construction Manager: W.T. Dick / VBE Joint Venture

ABROWSTREET
Technical Tools and Resources to Assist in Getting to Zero

Kate Bubriski
bubriski@arrowstreet.com
NBI On Demand Getting to Zero Webinars

https://newbuildings.org/webinar/

Zero Net Carbon Schools Webinar
A Deeper Dive into Zero Net Carbon Schools
Zero Energy Schools Are Achievable! Part 1
Financing Approaches for Getting to Zero Schools
Student Innovation and Initiatives Driving Zero Energy Adoption
... and more!

Getting to Zero Resources HUB

https://gettingtozeroforum.org/zero-energy-schools-resources/
Navigating the Getting to Zero HUB

SCHOOLS RESOURCES

HUB: Design and Process

ZERO ENERGY PROJECT GUIDE

SCHOOL REGENERATIVE ROADMAP NET ZERO SCHOOLS

ZERO ENERGY SCHOOLS STAKEHOLDER MESSAGING GUIDE

ZERO ENERGY SCHOOLS CHARLOTTE TOOLKIT

VIEW ALL RESOURCES

DESIGN & PROCESS

A review of energy, water, and waste reduction strategies for schools and school districts. The guide provides a framework for understanding energy, water, and waste reduction strategies and their impact on school performance.

FINANCING APPROACHES FOR GETTING TO ZERO SCHOOLS

The plan for financing and implementing the project includes a detailed financial plan, including funding sources, repayment strategies, and project costs.

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ZERO ENERGY SCHOOLS CHARLOTTE TOOLKIT
NBI’s Tools for Zero Net Energy Schools

Zero Energy Schools Charrette Toolkit

- Leads you through the process of planning, hosting and executing a successful ZE school integrated design charrette
- Includes:
  - Checklists
  - Sample Agendas for attendees & facilitators
  - Sample Email Invitations
  - Activities
  - Templates

newbuildings.org/resource/zero-energy-schools-charrette-toolkit/
Zero Energy Schools Stakeholder Messaging Guide

- Key messages for communicating zero energy with stakeholders
- Supporting facts and citations for each key message targeted towards specific stakeholders
- Provides background on key stakeholders such as their mission and priorities
- Other key pieces of information for understanding each stakeholder and communicating effectively

newbuildings.org/resource/zero-energy-schools-stakeholder-engagement-guide/

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Zero Net Energy Communications Toolkit

Getting to Zero: ZNE Project Guide

ZNE Communications Toolkit

What is Zero Energy (ZE)?

Gain Support for your ZNE Vision

Where are ZNE Projects?
2019 Schools Zero Energy Watch List

• Find schools to tour
• Find schools that have verified to research or contact
• EUI, building size and other data of verified and emerging zero energy schools

newbuildings.org/resource/2019-zero-energy-schools-watchlist/

HUB: Existing Buildings

BENCHMARKING

Evaluates the current energy and operating performance of the building compared to similar buildings in the same climate zone.

CALIFORNIA K-12 AND COMMUNITY COLLEGE ZERO NET ENERGY RETROFIT READINESS STUDY

An assessment of the energy needs and potential for retrofitting existing K-12 schools and community colleges in California to achieve zero net energy.

ADVANCED ENERGY RETROFIT GUIDE FOR K-12 SCHOOLS

A guide for school districts on how to achieve zero net energy through retrofits, including strategies for energy conservation and renewable energy integration.
HUB: Schools and Districts

SCHOOLS & DISTRICTS

Many schools face growing populations, aging buildings, constrained operating budgets, and increasing energy bills. Bonds to fund renovations in existing buildings and new construction projects offer a critical opportunity to drive better energy performance in schools. Examples of either district or school leadership on the path to zero can be extremely valuable when formulating your own plan. The outstanding examples here provide insights into successful implementation, starting the process, and maintaining momentum throughout the project lifecycle.

GETTING TO ZERO ENERGY IN SCHOOLS IS ACHIEVABLE! STORIES FROM SCHOOLS ON THE PATH TO ZERO

SCHOOLS

- Construction
- Design
- Energy targets
- Operations
- Review
- New assets
- Energy performance
- Commencements
- Education Engagement
- Codes
- Performance
- Monitoring
- Savings

SAN FRANCISCO UNIFIED SCHOOL DISTRICT CARBON REDUCTION PLAN

SFUSD is working on a multi-decade, multi-billion dollar carbon reduction plan by 2030. This plan includes an aggressive goal to achieve a 50% reduction in greenhouse gas emissions by 2030 and to be fully renewable by 2040. This goal was analyzed with input from facilities, building supplies, the Best Department and numerous other stakeholders from the City of San Francisco and students. Such sustainability projects have been selected based on performance metrics and are tracked through an energy management system, My Energy.

SAN FRANCISCO UNIFIED SCHOOL DISTRICT PROJECT REQUIREMENTS

Notably, the California State’s 2018 Design Energy Under Challenge (DEUC) has been instrumental in supporting the process by which designs, operations, and facilities-related decisions are made. While buildings must meet 2007 state building standards, buildings that are identified as LEED Platinum can be incentivized through design awards, and such facilities and schools have the potential to be a model for others.

HUB: State and National

STATE & NATIONAL

Commercial buildings make up the third largest sector of commercial building energy use, and energy consumption plays a significant role in the operational expenses of schools. Each year, a portion of state and federal dollars is spent on school utility expenses, thereby cutting into funding that could be allocated to resources for students. The examples here provide state and national programs with applicable context and examples.

CALIFORNIA PROP 39 ZNE PILOT PROGRAM

The Proposition 39 ZNE (Zero Net Energy) Pilot Program provides schools with additional financial resources to retrofit some of California’s existing K-12 and community college buildings to ZNE. In addition to annual savings goals, the program supports the development of best practices, training webinars and workshops as well as the ZNE School Leadership Awards and recognition program.

WASHINGTON SUSTAINABLE SCHOOLS PROGRAM (WSSP)

State schools on school construction in Washington are required by Chapter 296-180 WAC to incorporate high-performance buildings into school design and construction. Schools can use the Washington Sustainable Schools Program (WSSP) or Leadership in Energy and Environmental Design (LEED) to help with the process. The Washington Sustainable Schools Program (WSSP) was developed by the Collaborative for High-Performance Schools (CHPS) and incorporated feedback from schools that seek high-performance in Washington schools. WSSP is a certification standard developed to rate school district energy with the goal of 20% savings on energy in the buildings, which is a starting point that allows districts to plan for high-performance schools of all kinds. The plan supports the program by focusing on energy, other school-related matters, and for each project, the implementation process includes more topics such as building operations, energy management, and planning and operations.

MARYLAND NET ZERO ENERGY SCHOOLS INITIATIVE GRANT PROGRAM

The Maryland Energy Administration (MEA) and the Public School Construction Commission (PSC) have partnered in a Net Zero Schools Initiative to construct new net zero energy schools in Maryland. Through the 2019 merger of Conestoga Energy, the parent company of Baltimore Gas and Electric Company (BGE) and Baltimore Gas and Electric Company (BGE), Maryland’s largest electric and gas utility, was established to provide financial services for program energy-efficiency and demand-side goals. The Maryland Public Service Commission, the State’s regulatory body, has approved the use of $3 million of grant funding to create a program to enable the design and construction of three net zero energy buildings within the 2019-2021 timeframe.
Zero Net Energy Case Studies

https://gettingtozeroforum.org/schools/

ZEROENERGY.ORG

SCHOOLS
Zero energy schools provide excellent learning environments, energy cost savings, and reduced environmental impact.
Learn More

OFFICES
Zero energy offices provide inspiring, well-designed spaces for occupants, helping to improve productivity and satisfaction.
Learn More

DISTRICTS
Zero energy districts provide improved resiliency, competitiveness, and economies of scale.
Learn More
Advanced Energy Design Guide (AEDG) for Zero Energy Schools

By ASHRAE

Free download available at: https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download

How to Use the AEDG

• New construction focused but very applicable to retrofits
• Prescriptive path to achieve zero energy
• How set energy (EUI) targets
• Use modeling throughout design and construction
• Strategies for plug loads, lighting, building envelope, HVAC and more!
• Includes guidance for on-site renewable energy generation
• Using zero energy as a catalyst for student learning
Zero Energy Process Guide

By NREL and US Department of Energy

A complimentary guide to the Advanced Energy Design Guide for Zero Energy Schools

https://www.nrel.gov/docs/fy19osti/72847.pdf

Zero Energy Process Guide

• Applicable to a broad stakeholder audience
• New construction focused but applicable to retrofits
• Outlines the steps to procuring a zero energy school
• Guidance on how process decisions affect energy
Center for Green Schools Learning Lab
Curriculum resources for climate literacy, energy efficiency… and more!

Learning Lab
Access hands-on sustainability curriculum and resources to help K-12 educators bring classroom projects to life.

Type here to search...

Grade levels  Subject  Theme
All  All  All
Additional Resources

- NEEP High Performance Schools: http://www.neep.org/initiatives/energy-efficient-buildings/high-performance-schools
- USGBC Center for Green Schools: https://www.centerforgreenschools.org/
- Green Ribbon Schools: https://www2.ed.gov/programs/green-ribbon-schools/index.html
- Collaborative for High Performance Schools: https://chps.net/chps-criteria

Thank you

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