Incorporating Energy Efficiency into Business Approaches and Tools in Schools

Module 2 in the Energy CLASS Prize "Business & Communications Skills" Course

April 16, 2024

Welcome

Welcome and icebreaker time	10 mins
Lesson Plan • Effective Communication Recap • Pitching the Importance of the Champion (YOU) and the Energy Efficiency Team • Business Tools & Resources • Case Study: Aurora Public Schools	1 hour 30 mins
Discussion	20 mins

Icebreaker

Please put in the chat:

- Name
- District
- Location
- What subject do you wish was taught in every school?

Stock image

Course Objective

Review the fundamentals of effective communication techniques to strengthen stakeholder engagement efforts and how to leverage business tools and approaches to develop successful pitches for stakeholder buy-in.

1. Be able to implement techniques to communicate with stakeholders more effectively
2. Understand communication approaches and mediums to capture stakeholders
3. Learn effective conversation techniques to advocate needs to key stakeholders, listen to the stakeholders' responses, and reach a solution
4. Be able to use provided templates for specific project or planning needs

Today's Presenters

Shannon Oliver,
NBI

Alexi Miller,
NBI

Marcus Harper,
Aurora PS

Effective Communication Recap

Effective Communication Recap

- What is business storytelling?
  - Storytelling with an **objective, goal, or desired outcome** in mind
  - Can be powerful and **motivating**
  - Can **change opinions, inspire**, and show how things can change for the better
  - Conveys information in a **purposeful, engaging** way

Sustainability in Education: How Denver Public Schools are Pioneering a Green Revolution

Source: *Environment + Energy LEADER*

Effective Communication Recap

- Business communication is intended to achieve a specific goal, through information sharing between multiple people and/or groups
- There are a variety of interpersonal styles, types of communications, and mediums to convey communications

Tools and Resources Recap

- Save yourself time by:
  - Understanding policies you may have to comply with now or in the future
  - Seeing what successful communication campaigns have already done
  - Using templates that are already available
- Examples:
  - State or local policies
  - Board resolutions and policies
  - Public reporting and dashboards
  - Student engagement
  - **Business level processes** – more on this today!

Pitching the Importance of the Champion and Energy Efficiency Team

Importance of Energy Champion and Energy Efficiency team

- Generate enthusiasm by:
  - Raising awareness of sustainability impacts and benefits
  - Educating stakeholders to gain support
  - Informing decision makers to gain buy-in
  - Continually refocusing the team on health, energy, and carbon goals
- The energy efficiency team learns about healthy and energy efficient buildings and shares their findings with other stakeholders

How to approach “the pitch”

- The importance of the energy champion may be clear to you, but how do you pitch this need to relevant stakeholders?
- Understand the pain points and know how this position will address them
  - Example
    - Pain point: School leaders and Board members are concerned with additional costs imposed by a new staff position.
    - Resolution: Positions can pay for themselves with proper resources

Mentimeter Time

Pretend for a minute you are the superintendent of lead of your district…how would they rank certain issues?

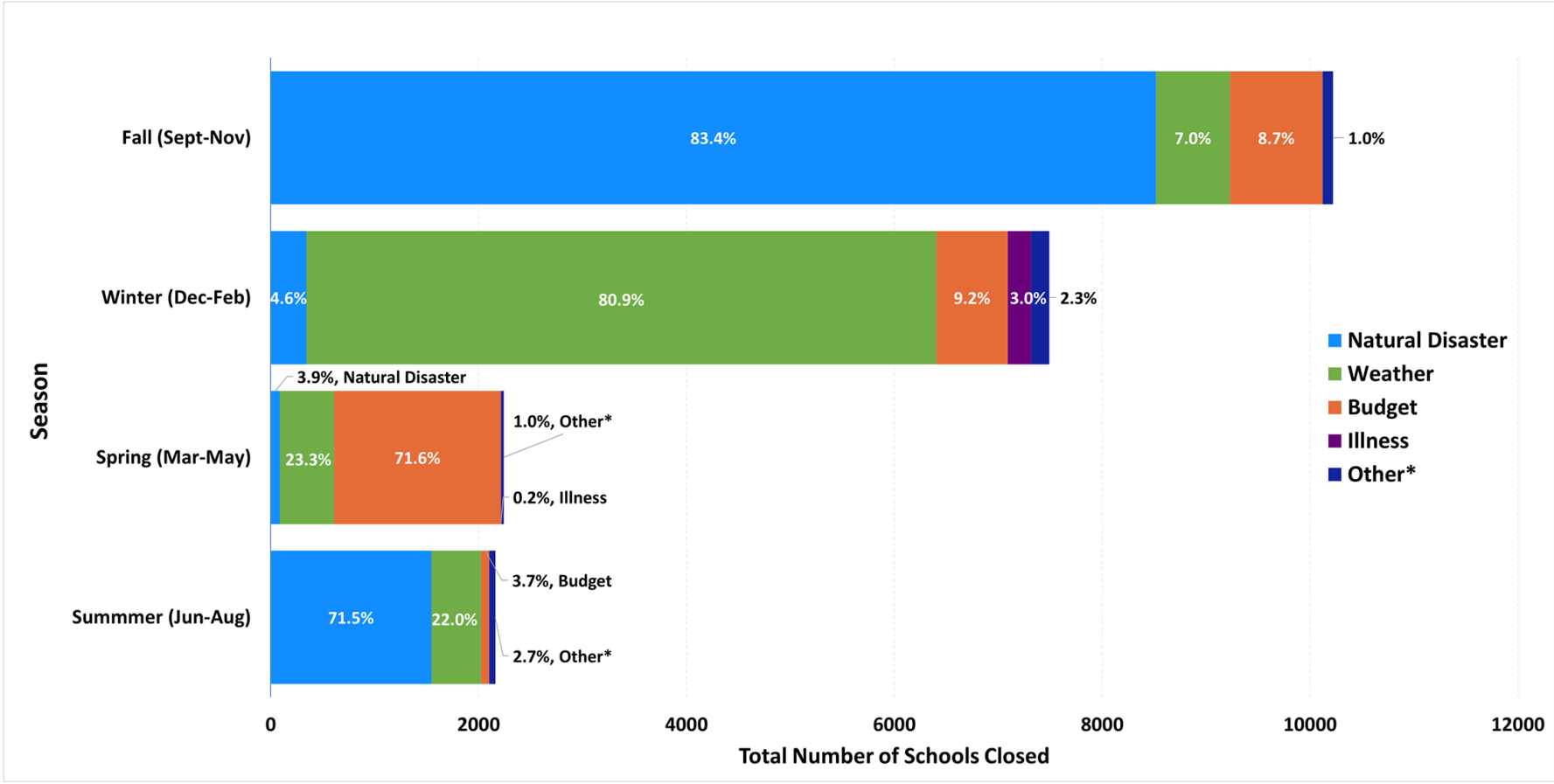
Instructions:

- Scan the Mentimeter code on your phone or enter on your computer browser.
- Respond to the prompts and answers will populate real time.

Why does your work matter?

During academic years 2011-2019, prolonged unplanned school closures resulted in **91.5 million student-days lost.** The three largest causes:

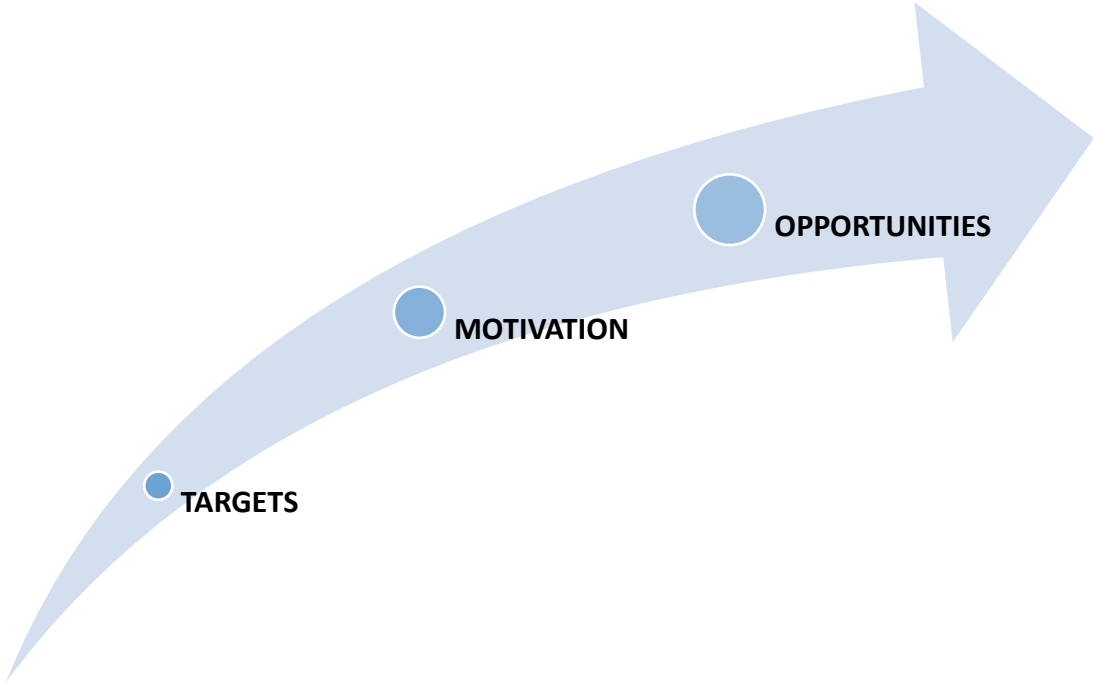
- Natural Disasters (47%)
- Adverse Weather (35%)
- Budgets/Strikes (15%)



Source: *Causes, characteristics, and patterns of prolonged unplanned school closures... 2022*

Understand Decision-Maker Drivers

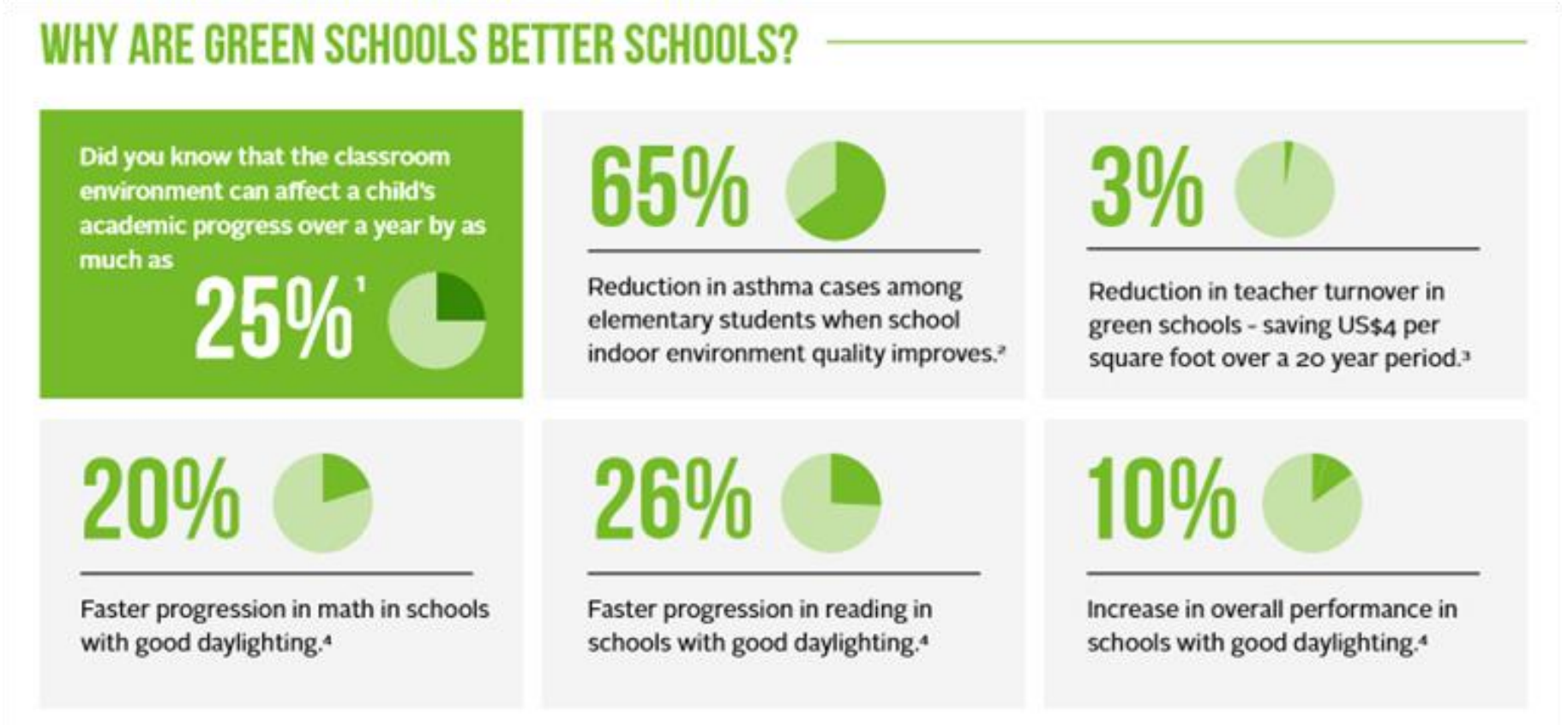
- What do they know about energy efficiency or emissions reduction targets?
- What motivates them?
- Do they understand the significance of buildings?
- How can you create opportunities to educate them?



How can your work affect your organization?

- Students and Student Performance
- Sustained and Resilient Operations
- Employee Satisfaction and Retention
- Education and Career Pathways
- Budget and Revenue
- Health and Safety

Students and Student Performance



Credit: World GBC

1. Barett, P., Zhang, Y., Moffat, J., & Kobbacy, K. (2012, October 03). A holistic, multi-level analysis identifying the impact of classroom design on pupils' learning.
2. Meng, Y., Babey, S. H., & Wolstein, J. (2012). Asthma-Related School Absenteeism and School Concentration of Low-Income Students in California.
3. Katz, G. (2006). Greening America's Schools: Costs and Benefits.
4. Heschong Mahone Group. (1999). Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance.

Employee Satisfaction and Retention

frontiers in Public Health

Front Public Health. 2022; 10: 890400.
Published online 2022 May 13. doi: 10.3389/fpubh.2022.890400

PMCID: PMC9136218
PMID: 35646787

Journal Article

Impact of Employees' Workplace Environment on Employees' Performance: A Multi-Mediation Model

Gu Zhenjing, [1] Supat Chupradit, [2] Kuo Yen Ku, [3,*] Abdelmohsen A. Nassani, [4] and Mohamed Haffar [5]

Source: Impact of Employees' Workplace Environment on Employees' Performance: A Multi-Mediation Model - PMC (nih.gov)

How physical workplace design can impact employee retention

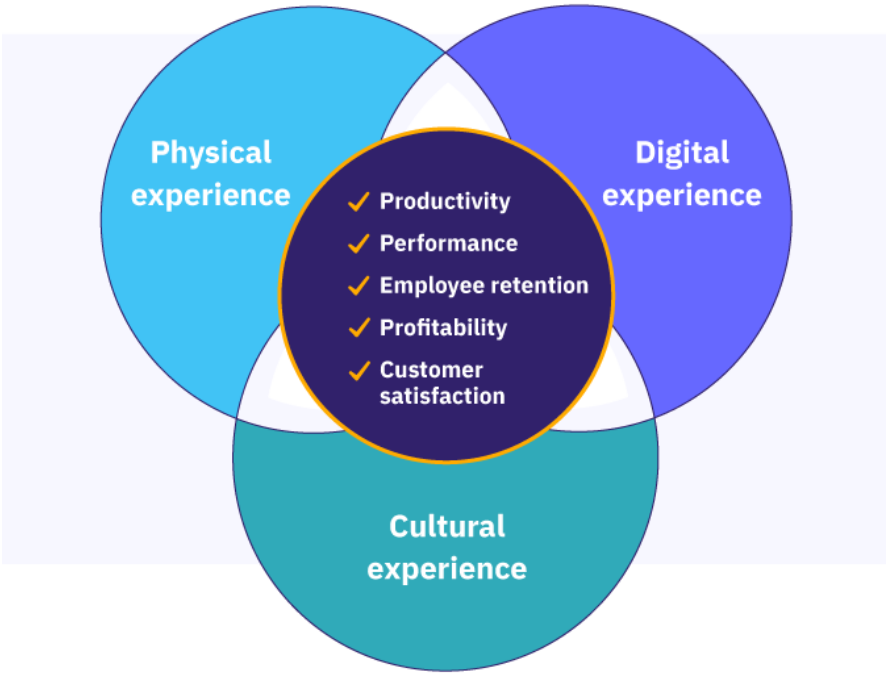
Ulf Muller
Executive Search and Engagement at myfm - Interim-Contract-Permanent - ulf.muller@myfm.co.uk - 0044 7906 266 499

3 articles + Follow

January 15, 2018

Source: (25) How physical workplace design can impact employee retention | LinkedIn

Employee Experience



Source: *Employee Experience: A Complete Guide for HR – AIHR*

Sustained and Resilient Operations

Climate Risk and Vulnerability Assessment

- Climate Exposure Impacts
- Climate-related Geographic Sensitivity
- Climate-induced Socioeconomic Sensitivity

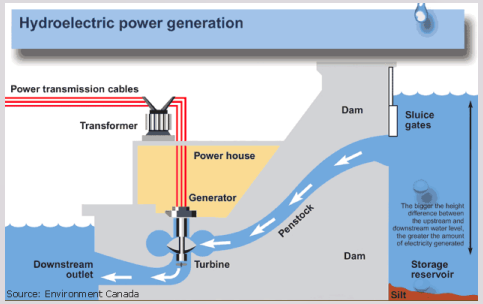
Understanding what impacts your community may experience is the first step to creating a resilience plan.

Key Resource: https://toolkit.climate.gov/steps-to-resilience/assess-vulnerability-risk

Education and Career Pathways

Connecting High School Applied Physics to Clean Energy

Power Systems
Hydraulics
Aerodynamics
Biological
Buoyancy
Auto Racing



Exposure to careers and trades (developing the future workforce)

Introduction to Renewable Energy: Field trips to Fenner Renewable Energy Education Center wind farm and SUNY Morrisville's renewable/sustainable college programs

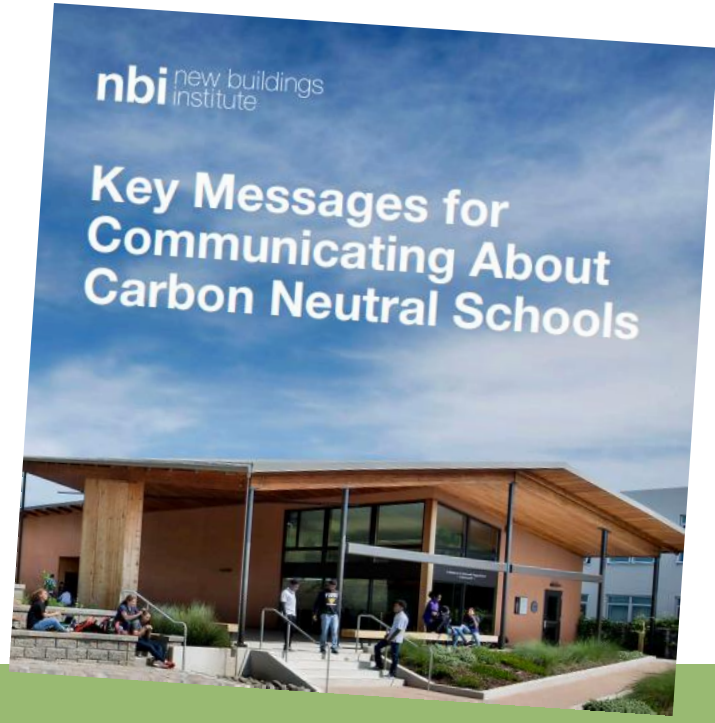
Hydroelectric Dams
Wind Turbines
Biomass and Biofuel
Wave and Tidal Energy
Solar, Batteries and EV

Source: Francis D'Ambrosio, Canajoharie CSD

Budget and Revenue

K-12 school districts spend nearly **$8 billion annually on energy costs**, the second largest expense after teacher salaries. Aging facilities combined with limited school budgets result in deferred maintenance of facilities with an **estimated $270 billion needed for infrastructure repairs**.

Schools and educational facilities are the **third largest sector of commercial building energy usage** in the United States.



Health and Safety

JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL HYGIENE
2022, VOL. 19, NO. 8, 478–488
https://doi.org/10.1080/15459624.2022.2089675

Taylor & Francis
Taylor & Francis Group

Check for updates

Relationships between social climate and indoor environmental quality and frequently reported health symptoms among teachers and staff in a suburban school district

er Schill[c], Matthew Klimm[c], Jennifer E. Cross[d,e], Shannon Oliver[f], and

nity Health, University of Illinois at Urbana-Champaign, Champaign, Illinois; [b]Department of ciences, Colorado State University, Fort Collins, Colorado; [c]Institute for the Built Environment, olorado; [d]Institute for Research in the Social Sciences, Colorado State University, Fort Collins, rado State University, Fort Collins, Colorado; [f]Manager, Energy and Sustainability, nent of Epidemiology, Colorado School of Public Health, Aurora, Colorado

Environmental Science and Pollution Research (2020) 27:16624–16639
https://doi.org/10.1007/s11356-020-08092-w

RESEARCH ARTICLE

Check for updates

Identifying and evaluating school environmental health indicators

Shao Lin [1,2] · Yi Lu [1] · Ziqiang Lin [1] · Xiaobo Xue Romeiko [1] · Tia Marks [1] · Wangjian Zhang [1] · Haider A. Khwaja [1,3] · Guanghui Dong [4] · George Thurston [5]

International Journal of
Environmental Research and Public Health

MDPI

Article

Indoor Air Quality Prior to and Following School Building Renovation in a Mid-Atlantic School District

Sandra E. Zaeh [1,2], Kirsten Koehler [3], Michelle N. Eakin [2], Christopher Wohn [4], Ike Diibor [4], Thomas Eckmann [2], Tianshi David Wu [5,6], Dorothy Clemons-Erby [3], Christine E. Gummerson [7], Timothy Green [3], Megan Wood [3], Ehsan Majd [8], Marc L. Stein [9,10], Ana Rule [3], Meghan F. Davis [3,11] and Meredith C. McCormack [2,*]

ELSEVIER

Contents lists available at ScienceDirect

International Journal of Hygiene and Environmental Health

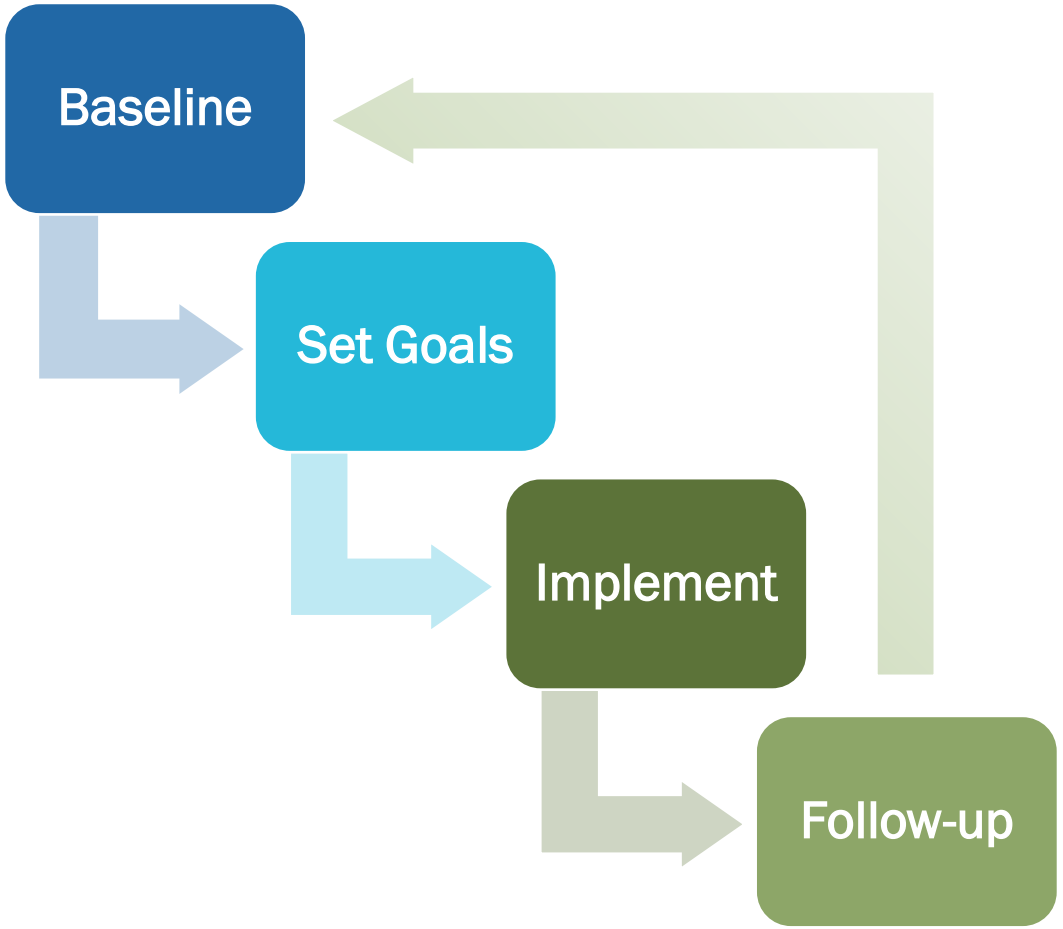
journal homepage: www.elsevier.com/locate/ijheh

School environmental conditions and links to academic performance and absenteeism in urban, mid-Atlantic public schools

Check for updates

J.D. Berman[a,*,1], M.C. McCormack[b], K.A. Koehler[c], F. Connolly[d], D. Clemons-Erby[c], M.F. Davis[c], C. Gummerson[b], P.J. Leaf[e], T.D. Jones[f], F.C. Curriero[a]

Don’t Forget the Process!



Regardless of the subject of your work (energy, GHGs, IAQ, economics), you need to know:

- Where are you starting?
- Where do you want to go?
- Who needs to be in the room and how do you get there?
- What did you achieve?

Business Tools and Approaches

Right Tool for the Job

- There are many business tools and approaches!
- Know your audience to know what tool is right.
- Consider incorporating energy efficiency into the following documents:
  - Facility Master Plan
  - Energy Plan
  - Request for Proposal vs Request for Information
  - Life-Cyle Cost Assessment
  - Owner's Project Requirements
  - Financial Metrics

Prepare to Use these Tools!

- Benchmarking (eg Energy Star Portfolio Manager)
- Energy audits (e.g. ASHRAE Level 1, 2 or 3)
- Building operator training (eg Certified Building Operator)
- Submetering (e.g. flow meters)

Facility Master Plan

- A strategic document to help guide a facility's long-term development, maintenance, and improvement.
- Incorporate Energy, Carbon, and/or Financial goals:
  - EUI Targets for new and major renovation projects.
  - Require solar and/or EV ready for new construction.
  - Require Lifecycle Cost Analysis for all projects over $# cost.
  - Incorporate rating systems such as LEED, WELL, CHPS, or others.

Source: https://www.scasd.org/page/870

Example targets for Zero Energy

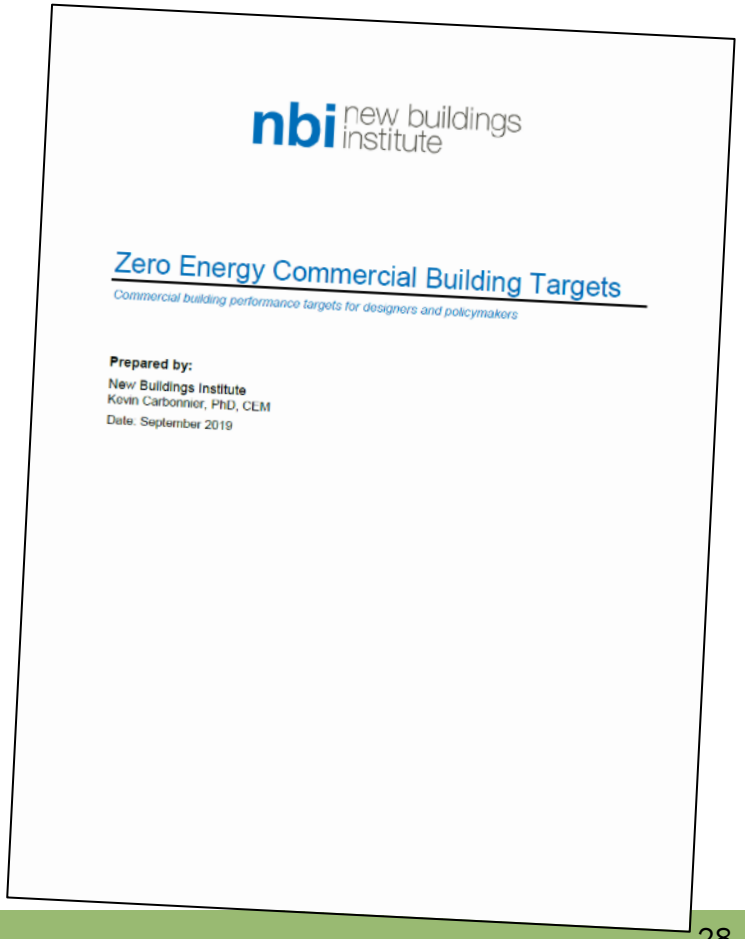
For example: Zero Energy EUI Targets (NBI, Sept. 2019)

2030 CHALLENGE Targets: U.S. National Medians

U.S. Medians for Site Energy Use and 2030 Challenge Energy Reduction Targets by Space/Building Type[1]

From the Environmental Protection Agency (EPA): Use this chart to find the site fossil-fuel energy targets

Building Use Description[2]	Available in Target Finder[3]	Median Source EUI[4] (kBtu/Sq.Ft./Yr)	Average Percent Electric	Median Site EUI[4] (kBtu/Sq.Ft./Yr)	2030 Challenge Site EUI Targets (kBtu/Sq.Ft./Yr)				
					50% Target	60% Target	70% Target	80% Target	90% Target
Education		144	63%	58	**29.0**	23.2	17.4	11.6	5.8
K-12 School	X								
College / University (campus-level)		244	63%	104	**52.0**	41.6	31.2	20.8	10.4
Food Sales		570	86%	193	**96.5**	77.2	57.9	38.6	19.3
Grocery Store / Food Market	X								
Convenience Store (with or without gas station)		657	90%	228	**114.0**	91.2	68.4	45.6	22.8
Food Service		575	59%	267	**133.5**	106.8	80.1	53.4	26.7
Restaurant / Cafeteria		434	53%	207	**103.5**	82.8	62.1	41.4	20.7


nbi new buildings institute

Zero Energy Commercial Building Targets

Commercial building performance targets for designers and policymakers

Prepared by:

New Buildings Institute

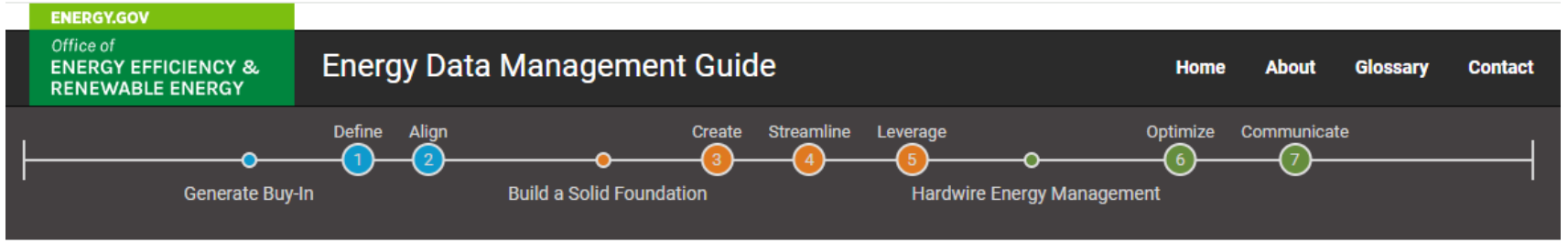
Kevin Carbonnier, PhD, CEM

Date: September 2019

Energy Plan

- A long-term blueprint that outlines the methods and strategies to be implemented in order to reach predetermined goals for energy efficiency, monitoring, and/or benchmarking.
- Incorporate Energy, Carbon, and/or Financial goals:
  - EUI reduction targets (gross, per year, for specific buildings, etc.).
  - Greenhouse gas reduction targets (gross, intensity-based, for specific fuel types, etc.).
  - Annual budget reduction targets (gross, per year, for specific fuel types, etc.).

Energy Plan



K-12 School Spotlight: Poudre School District, Fort Collins, Colorado

Bundling Energy Management with Bill Processing and Payment

Summary

Poudre School District (PSD) integrated energy data management into the organizational structure by establishing the Energy Conservation Program and hiring an energy manager that implemented utility data management, utility bill oversight, and pursued energy efficiency projects. Since the program was established in 1993, PSD has saved more than $615,000 per year with cumulative savings of over $2 million through 2012.

Goal: Achieve a 20% reduction in energy intensity by 2020 from a 2008 baseline across school facilities and comply with a municipal mandate to reduce greenhouse gas emissions by 20% by 2020 from 2005 levels.

Barrier: Lack of process, team, or unified organizational plan to manage data.

Solution: Integrated energy data management into the organizational structure by establishing the Energy Conservation Program and hiring an energy manager that implemented utility bill oversight, energy management, and pursued energy efficiency projects.

Outcomes: Achieved ongoing yearly savings of more than $615,000 since 1993 and cumulative savings of over $2 million through 2012.

Source: https://eere.energy.gov/energydataguide/case-study-poudre-school-district.shtml

Request for Proposal (RFP)

- Document used to describe a project in detail and solicit bids from potential vendors or contractors.
- Use targets and legally binding language to ensure efficiency measures and carbon reduction are incorporated.
- Incorporate requirements such as:
  - Forbidding fossil fuel burning equipment
  - Requiring Lifecycle Cost Analyses
  - Specifying certain equipment, manufacturers, or operational requirements

RFP Examples

Northeastern University
Planning, Real Estate, and Facilities

Planning, Real Estate, and Facilities | 360 Huntington Avenue, 110-216, Boston, MA 02115 | 617.373.2700

DATE: November 2, 2023
RE: Request for Proposal for Specialty Consulting Services
PROJECT: [redacted] – Utility, Decarbonization and Resiliency Plan - CWL

Walla Walla Public Schools
364 S Park St
Walla Walla, WA 99362

REQUEST FOR QUALIFICATIONS AND PROPOSALS

SUSTAINABILITY PLAN RECOMMENDATIONS FOR WALLA WALLA PUBLIC SCHOOLS

Walla Walla Public Schools (District) is requesting proposals from qualified sustainability consultants with experience working in K-12 educational settings. The selected Consultant/Firm will work with the assigned District manager and stakeholders to develop sustainability recommendations to be considered for planning and possible implementation.

Request for Proposal (RFP)

Resource:

[Sample RFP for Schools - NYSERDA]

E. Requirements for the Energy Audit

The proposal must include provisions for the performance and presentation of results of a Comprehensive Energy Audit for the school facilities identified in Appendix B. The selected ESCO will gather and analyze information and data and propose a project to the School District in a Comprehensive Energy Audit report that would reduce the District's expenses for energy. As part of the audit, the ESCO will conduct an on-site survey of the facilities and will interview appropriate personnel to learn the operating characteristics of the facility and the existing equipment and systems therein.

The Comprehensive Energy Audit Report will present an analysis and discussion of the ESCO's proposed energy efficiency measures for each building. The report will detail the ESCO's proposed methodology for the calculation of baseline energy use and, at a minimum, a description of physical conditions, equipment counts, nameplate data, and control strategies prior to project implementation. The energy use allocation must be based on generally accepted engineering practices and must be reconciled with historic usage. In addition to presenting how the proposed baseline is derived, the proposal must define under what conditions it will be adjusted; for example, changes in weather, occupancy, and equipment usage.

For each measure recommended, the Comprehensive Energy Audit Report will provide a detailed description to include: total implementation costs for each measure, equipment counts, performance characteristics and efficiency levels of the equipment comprising the proposed measure, installation and maintenance costs, its useful life, and projected annual energy, demand and cost savings. Projected energy savings calculations must specifically account for energy savings on and off-peak, demand savings, and the interaction between recommended measures.

The report will include an executive summary which lists all proposed energy efficiency measures with the implementation cost, estimated energy savings, energy cost savings, useful life of the equipment and the simple payback (individual and interactive). Payback of each measure should be reported without the inclusion of State Building Aid which may be available to the project.

Life Cycle Cost Assessment (LCCA)

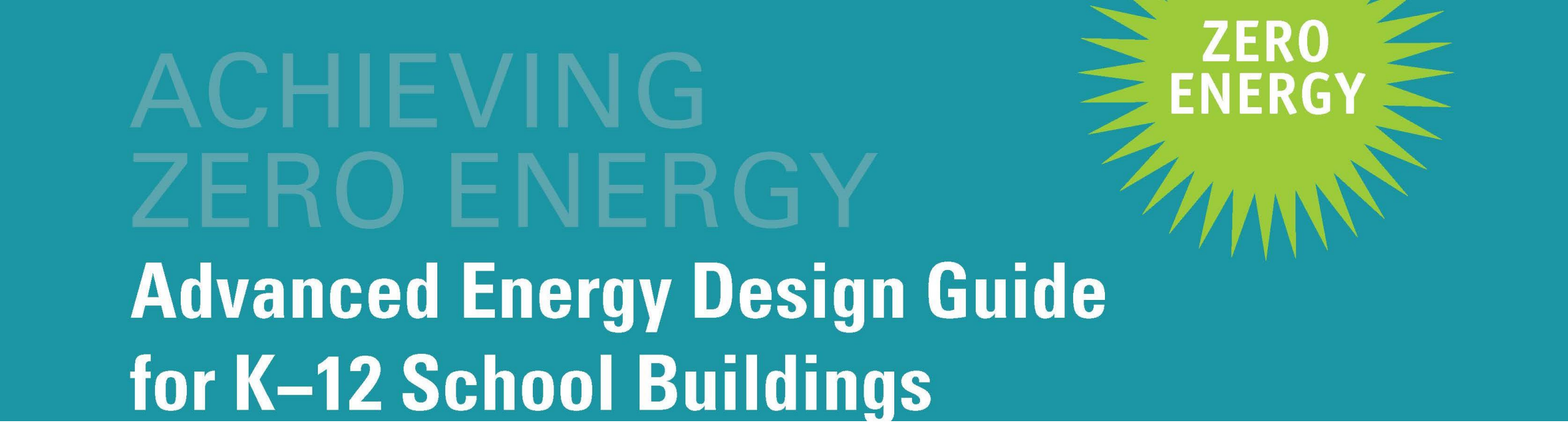
- Method for assessing the total cost of acquiring, owning, operating, and disposing of a facility.
- Best applied in the design phase of large, complex projects such as new facility construction or major modernizations.
- Allows for comparison of major system choices (i.e. chiller/boiler vs GSHP) and EV/EVSE projects, and onsite renewable or storage projects.

- Resource: NIST Life-Cycle Cost Analysis (LCCA)

Owner's Project Requirements (OPR)

- Document(s) that outline(s) specific conditions, goals, and design specifications set by the district for use by contractors and vendors.
- Best used for efficiency measures, such as:
  - HVAC control requirements or settings for efficiency
  - Lighting Power Density requirements
  - Lighting control requirements
  - R-value and U-value requirements

HINT: seek existing standards and recommendations from certification programs and national standards



Resource

[ASHRAE Advanced Energy Design Guideline for K-12 School Buildings]

Financial Metrics 101

- Return on Investment (ROI)
  - Provides the number of years or months it will take to recoup an investment that saves money or produces revenue.
  - $$ saved/yr ÷ # yr savings happen = simple payback or ROI in years
- Avoided Cost
  - Represents financial “savings” that result from using fewer resources.
  - Resources might include labor hours, energy and other utilities, or product.
  - Often better represents the financial arguments of energy efficiency projects over “cost savings”.

Financial Metrics 201

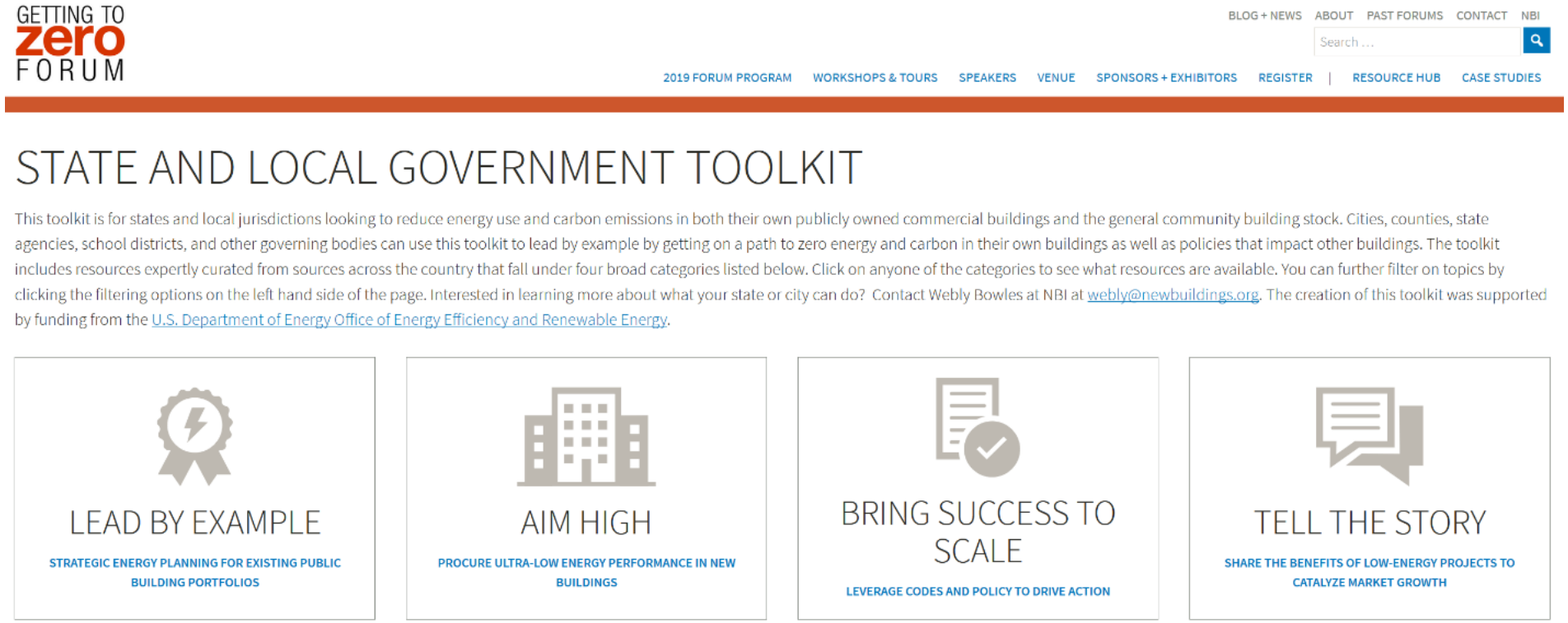
- Net Present Value (NPV)
  - Present value of cash flows compared to the cost of investment.
  - Similar to ROI, but better for revenue producing projects like onsite energy production.
  - $NPV = \frac{R_t}{(1+i)^t}$
  - R_t= net cash flow at time of t; i = discount rate; t = time of cash flow

- Internal Rate of Return (IRR)
  - Calculates the rate at which an energy efficiency or revenue producing project pays for itself.

$$0 = NPV \sum_{t=1}^{T} \frac{C_t}{(1+IRR)^t} - C_0$$

where,
C_t = *Net cash inflow during period t*
C_0 = *Total initial investment cost*
IRR = Internal rate of return
t = Number of time periods

State and Local Government Toolkit



Source: https://gettingtozeroforum.org/local-governments/

Leverage Recognition

- Efficient and Healthy Schools Program
- Better Buildings Challenge K-12 Schools
- US Dept of Ed Green Ribbon Schools
- LEED Certifications
- Collaborative for High Performance Schools
- US Dept of Energy Integrated Lighting Campaign

LEED Platinum Certification

CHPS Certification for Schools

Case Study

Aurora Public Schools

Case Study:

Aurora Public Schools

Energy Performance Contracting

AURORA PUBLIC SCHOOLS

Presented by:
Marcus A. Harper
Energy, Building Optimization, and Renewable Resources Manager
Date: April 16, 2024

Aurora Public Schools

APS at a Glance…

- 38,000 Students
- 75 District Buildings
- $10M+ Utilities Budget
- $473M General Budget

Project Summary

- **Comprehensive Campus Wide Lighting Upgrade**
- **Water efficiency improvements, continuous commissioning, building envelope improvements**
- **1.1 MW Ground Mount Solar PV System**
- **Student/Staff Engagement Program**

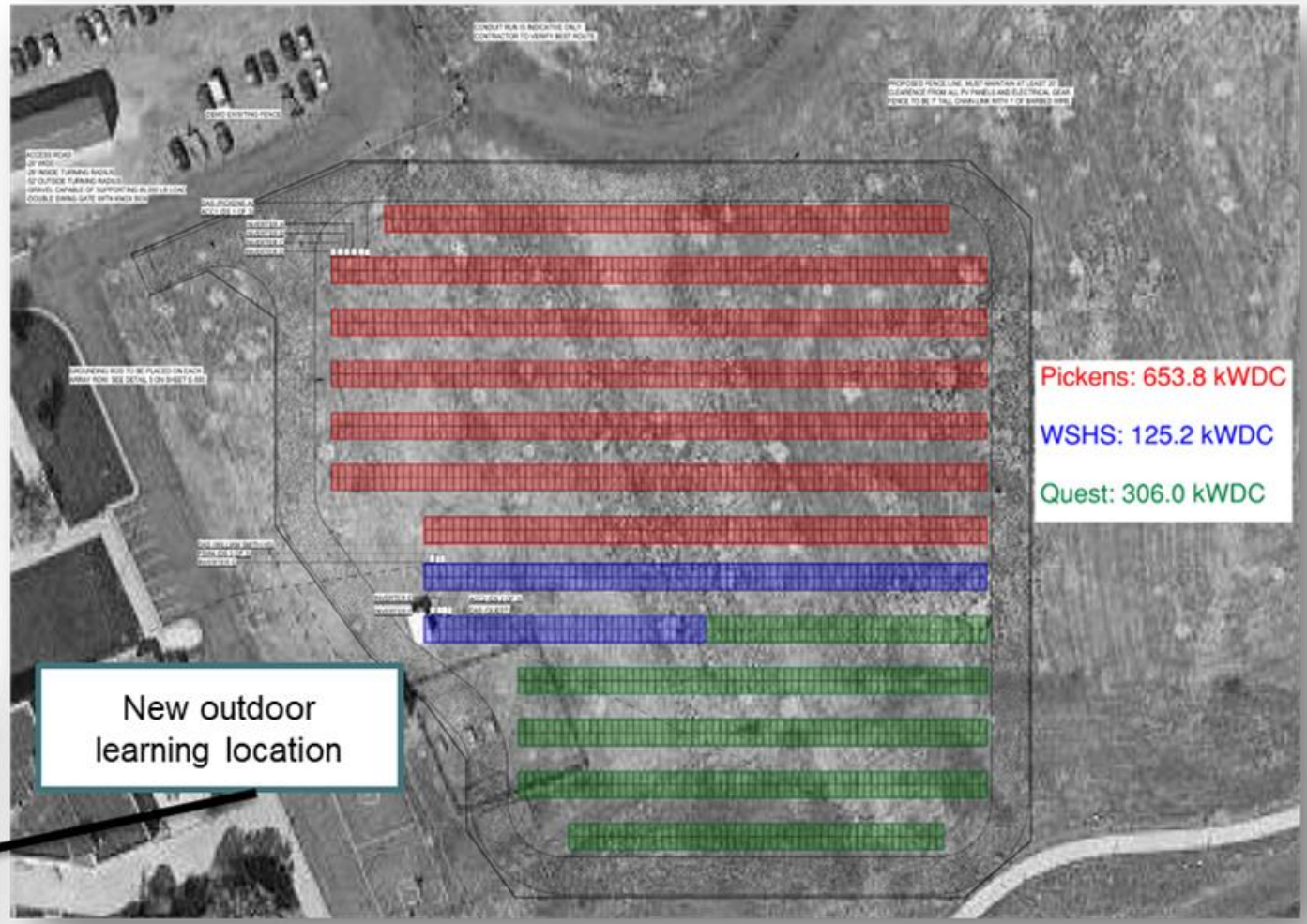
- **Total Cost Savings:** $430k/yr
  - (Electricity + Natural Gas + Water + PV + RECs + O&M).
- **Total ACC Site Utility Cost Reduction:** 36% (including REC $'s)

- **Ground Mount Solar PV System:** 1.1 MW
- **PV Power offset: 45%** electricity offset for Pickens, **90%** at WSHS & Quest
- **IRA Direct Pay PV Financial Benefit:** ~$1.2M

- **Total Annual GHG Emission Reduction:** ~2,155 tons of CO2
- **ACC Site EUI Reduction:** 90 to 64 kBtu/ft^2
- **Outdoor learning center at PV array**

Ground Mount System

- 1,085 kWDC
- Offset usage at Pickens (45% offset), William Smith HS (90% offset), and Quest (90% offset)
- 1,300 MT/yr CO^2 GHG reduction
- Would require combining parcels
- Highly visible ground mounted system
- Allowances included in project for: access road, outdoor gazebo structure, fencing and detention pond modifications (if required)

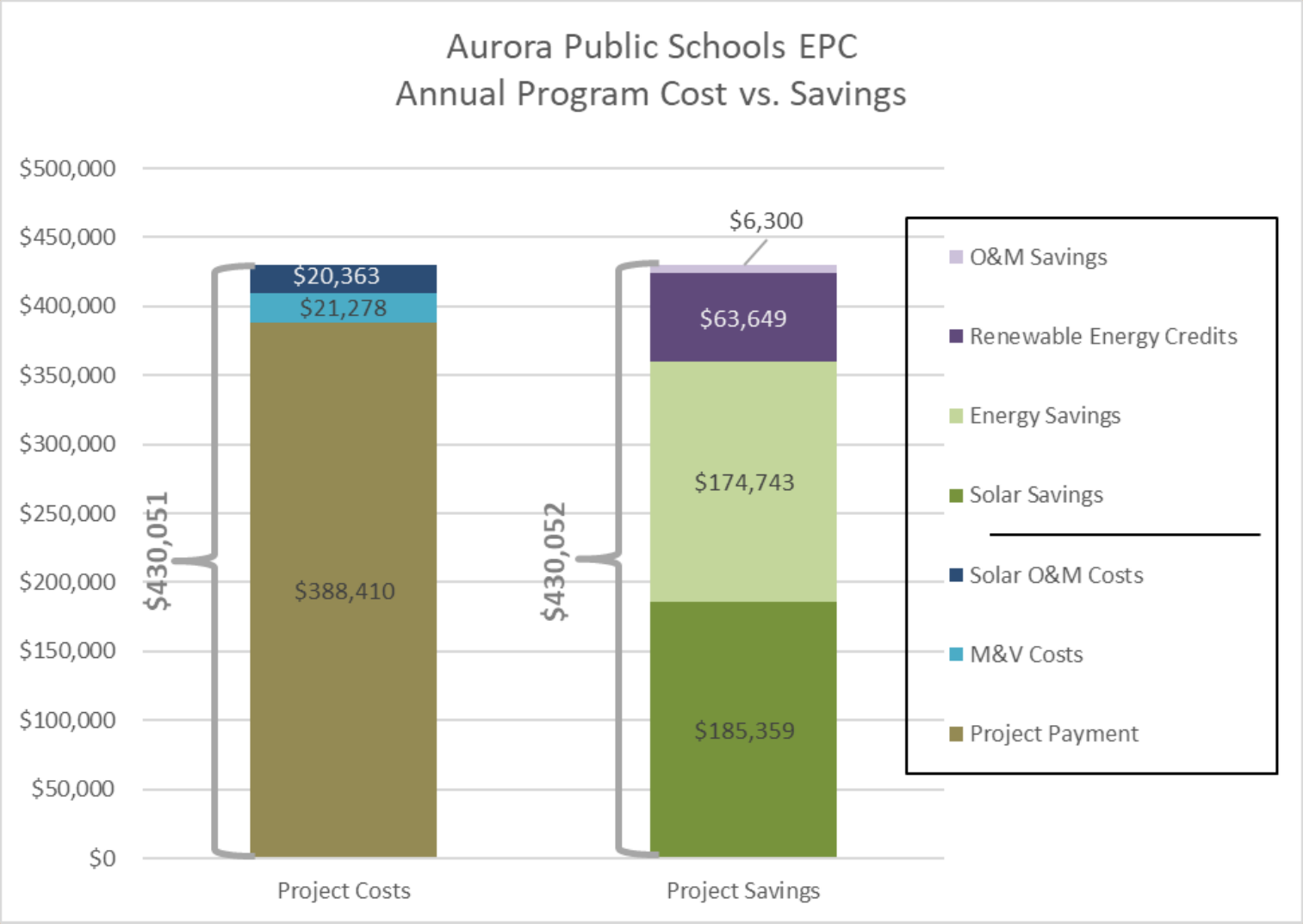


Impact

EPC Project Cost:	**$7.7M**
Annual Utility Savings:	**$359K**
Anticipated Annual REC Payments:	**$64K**
Annual O&M Savings:	**$6K**
Anticipated Rebates:	**$89K**
Total EPC Annual Savings:	**$430K**
Positive Cash Flow Over 30 Yrs:	**$3.6M**
NPV (30 yr at 3%):	**$1.7M**

100% self-funded project over 20 yrs!

Impact

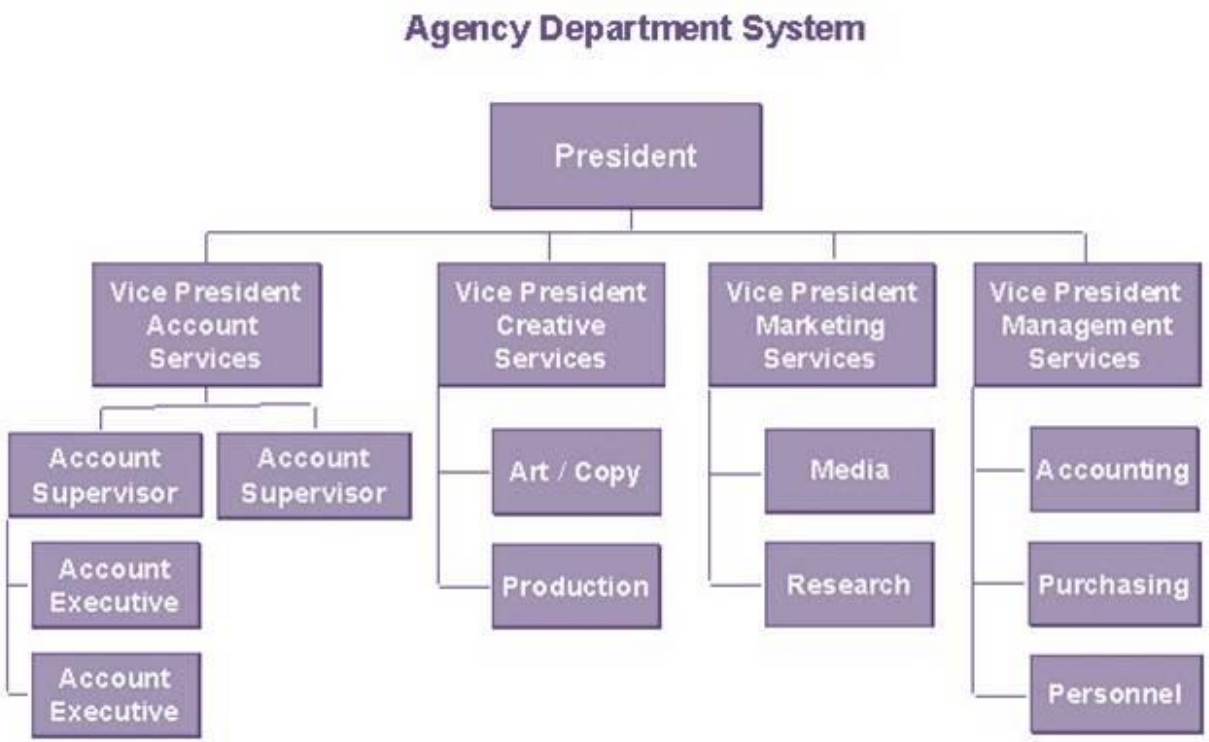


- Budget neutral solution to improve the learning environment and District facilities
- Savings are guaranteed to be greater than payment
- This guarantee is overseen by the Colorado Energy Office in collaboration with Aurora Public Schools and McKinstry
- Positive cashflow from this EPC amounts to $3.6M over 30 years

The Path To Project Approval

1. **Organizational Overview**
2. Project Planning and Vision
3. Stakeholder Collaboration
4. Approval Phase
5. Project Implementation

Organizational Overview



Me

Director of M&O

District COO

Leadership Team

APS Board of Ed

The Path To Project Approval

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Project Planning and Vision

- Project Conceptualization & Design
- Planning Implementation and Management
  - Internal vs External
- Cornerstone Stakeholders
  - Contractors/Consultants/ESCOs

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Stakeholder Collaboration

- Cornerstone Stakeholders
- Path of Influence Stakeholders
- End User Stakeholders
- Naysayers (still important stakeholders)

The Path To Project Approval

1. Organizational Overview
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4. **Approval Phase**
5. Project Implementation

Approval Phase

- Preliminary Approval
  - High Level Management
- Final Approval
  - Superintendent/School Board

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2. Project Planning and Vision
3. Stakeholder Collaboration
4. Approval Phase
5. **Project Implementation**

Project Implementation

- Coordination Meetings
- Measurement & Verification
- Project updates communicated to stakeholders
- Project Debrief
- Ride the Momentum for support of additional projects

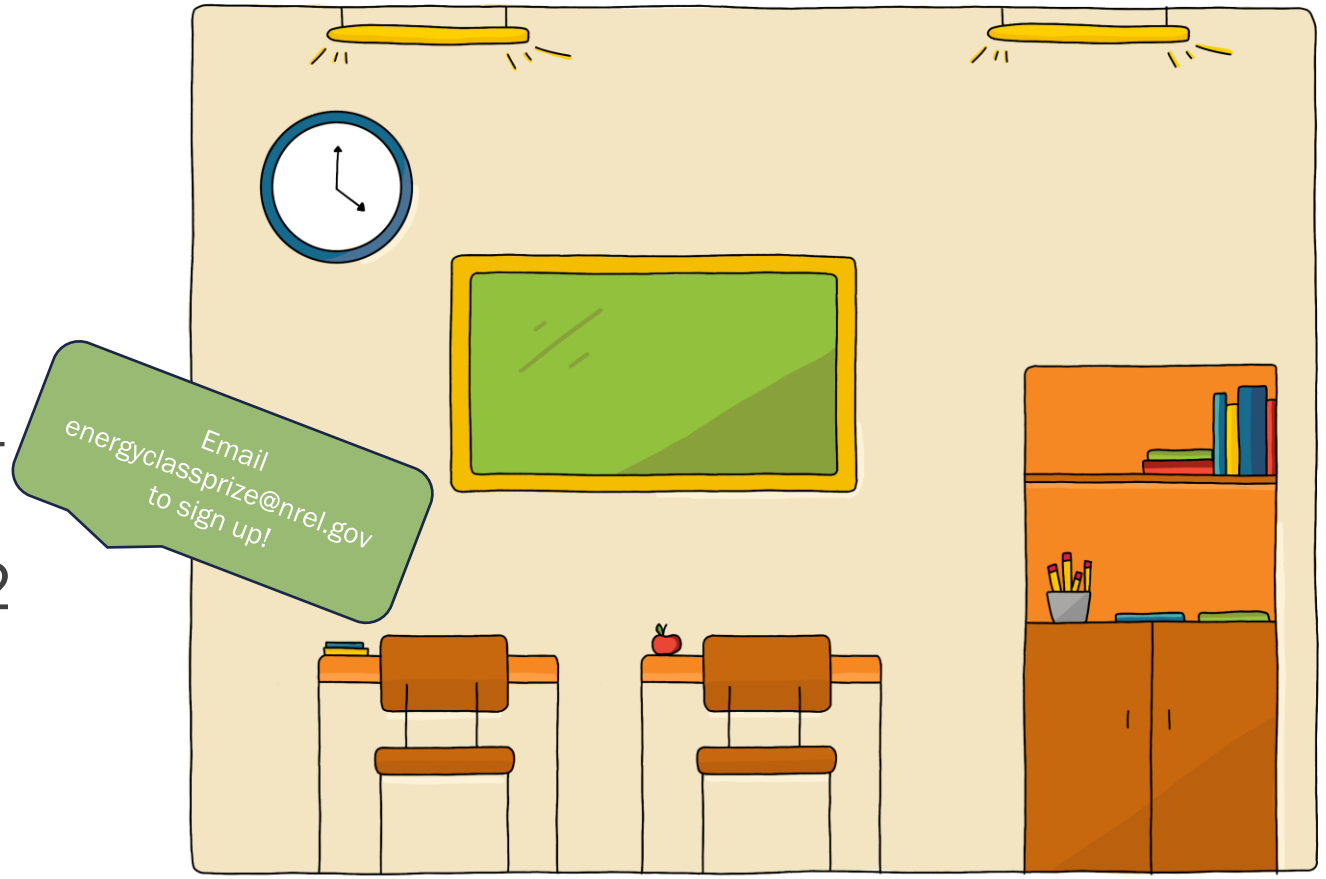
Questions?

AURORA

PUBLIC SCHOOLS

Next Up in CLASS…

- **April 23rd** - Cohort Session
  - 1-3pm ET
- **May 17th** - Phase 2 Submission Deadline
  - 5pm ET
- **May 21st** - Virtual Presentation #1
  - 2-3:30pm ET
- **May 30th** - Virtual Presentation #2
  - 3-4:30pm ET
- **June 26th** - Virtual Graduation
  - 1-1:45pm ET



Cohort Session Details

- Work on your presentation for the Phase 2 submission and virtual presentation event
- Live virtual presentation events:
  - Virtual Presentation #1: May 21, 12-1:30pm MT
  - Virtual Presentation #2: May 30, 1-2:30pm MT
- Other participants will provide feedback, suggestions, and support after your pitch
- Any stage of progress is welcome!

Discussion

Use Your Tools

1. What tools or data do you think would be most effective to communicate with your different stakeholder groups?
2. Have you created any tools to help you make the business case? If so, what processes have you followed to make them?

Questions?

We look forward to working with you!