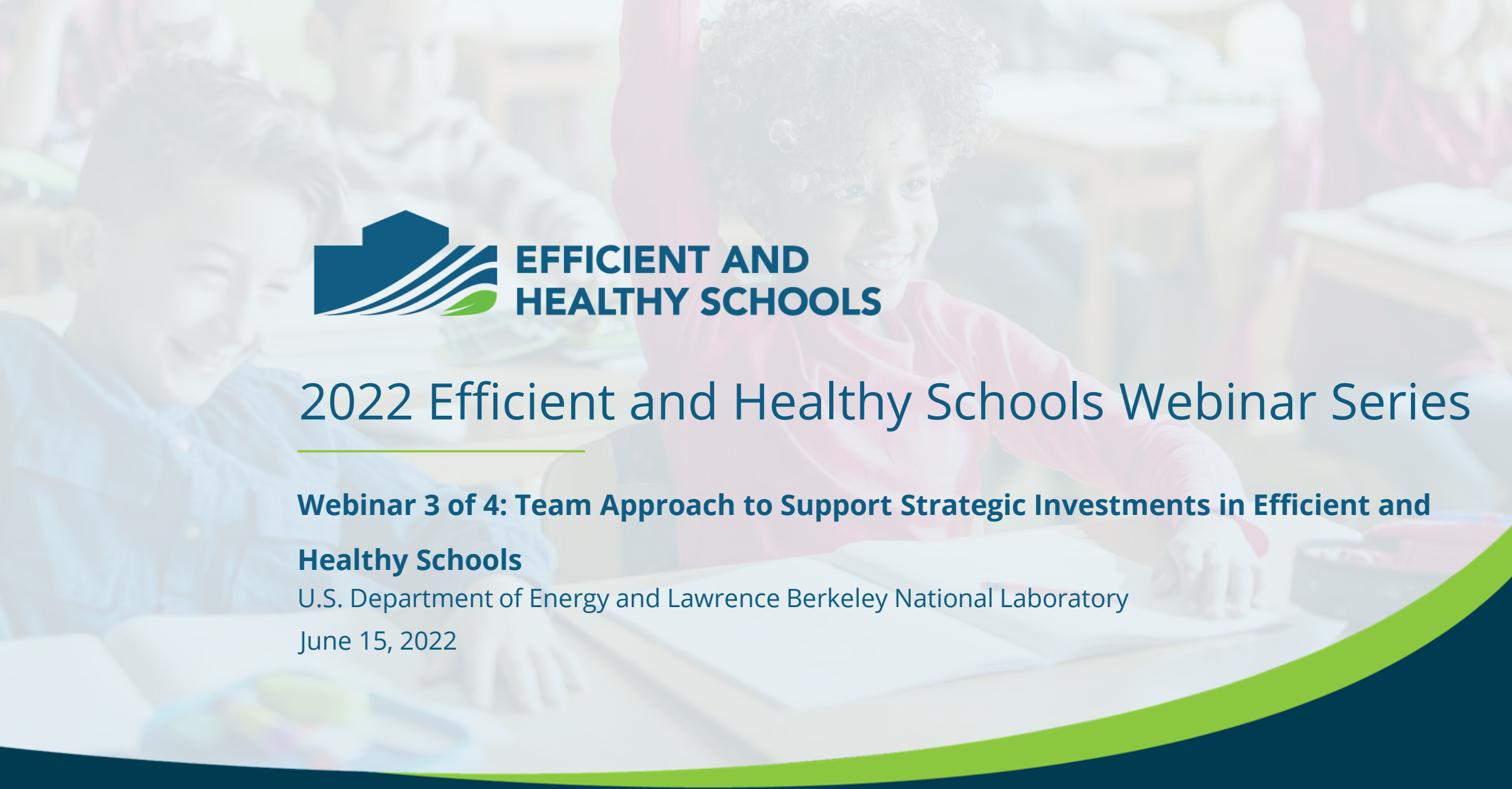


EFFICIENT AND HEALTHY SCHOOLS

2022 Efficient and Healthy Schools Webinar Series

Webinar 3 of 4: Team Approach to Support Strategic Investments in Efficient and Healthy Schools

U.S. Department of Energy and Lawrence Berkeley National Laboratory

June 15, 2022

Efficient and Healthy Schools Campaign Webinar

Welcome!

- Agenda is in the chat
- Webinar is being recorded
- All attendees are muted
- Please enter questions into the chat - they will be answered during the question and answer session toward the end
- We will send out the slides and presentation the week after the webinar

Today's Webinar, Summary

- Campaign Introduction – Rengie Chan, Berkeley Lab
- Campaign recognition program awardees presenting:
  - Best in Class – Boulder Valley School District, Ghita Carroll and Jeffrey Medwetz
  - Best in Class – Charleston County School District, Ronald Kramps
- Decarbonization Roadmap - Reilly Loveland, New Buildings Institute
- Question and answer session, moderated by Rengie Chan

EFFICIENT AND HEALTHY SCHOOLS

Efficient and Healthy Schools Campaign

The campaign aims to engage K-12 schools to improve energy performance and indoor air quality, with a focus on practical solutions involving HVAC and other technologies to reduce energy use and carbon emissions. This campaign is led by the U.S. Department of Energy with technical support from Lawrence Berkeley National Laboratory.

Organizing partners

Recognition Program: 2021 Round One

The Efficient and Healthy Schools Campaign aims to recognize schools and school districts that have implemented exemplary solutions involving HVAC upgrades and other approaches to reduce energy costs, and improve energy efficiency and indoor air quality.

Areas for Recognition

www.epa.gov/iaq-schools

- Schools and school districts with a formal collaboration between facilities personnel, school administration, and the community for strategic planning and investment in efficient and healthy buildings.

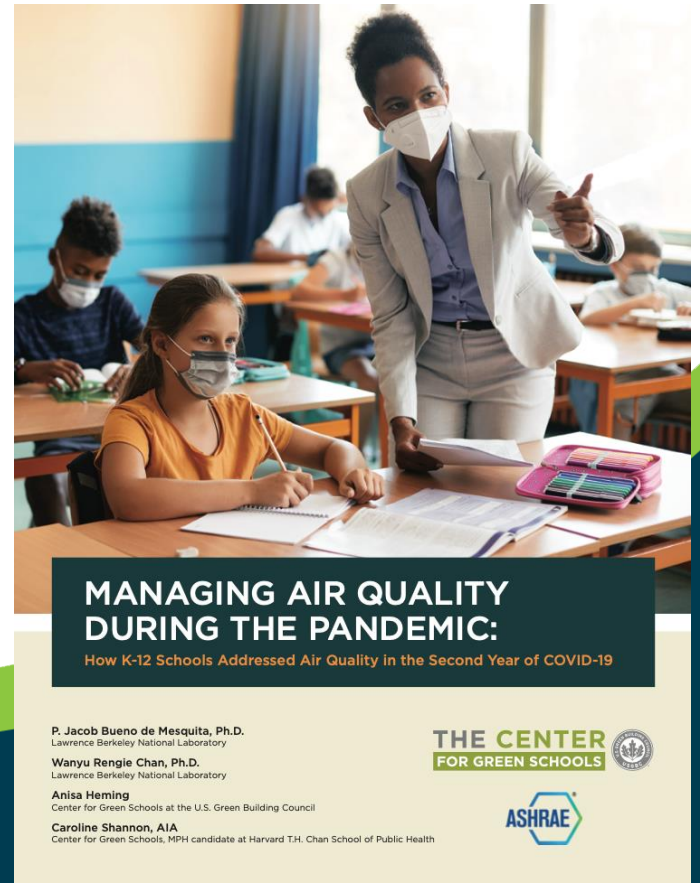
- In addition to setting quantitative energy goals, the best-in-class applicants also described in their submissions the role of energy management team, how information is communicated with the school community, and the incorporation of IAQ best practices.

Recent Survey (Oct-Dec 2021) of 88 School Districts

- Who among your school community were involved in deciding which ventilation, filtration, and other building controls to implement in your buildings? Check all that apply.

# Decision Makers	Facilities Staff	Superintendent	School-Level Admin.	School Board	Teachers / Parents	% Responses
Four or more	X	X	X	X and/or	X	23%
Three	X	X	X or	X		23%
Two	X	X or	X			28%
One	X					26%

https://www.usgbc.org/resources/managing-air-quality-during-pandemic-how-k-12-schools-addressed-air-quality-second-year



Key to Success

- Set goals
- Dedicated team to take charge of energy and IAQ management
- Engage school community
  - Monitoring
  - Communication

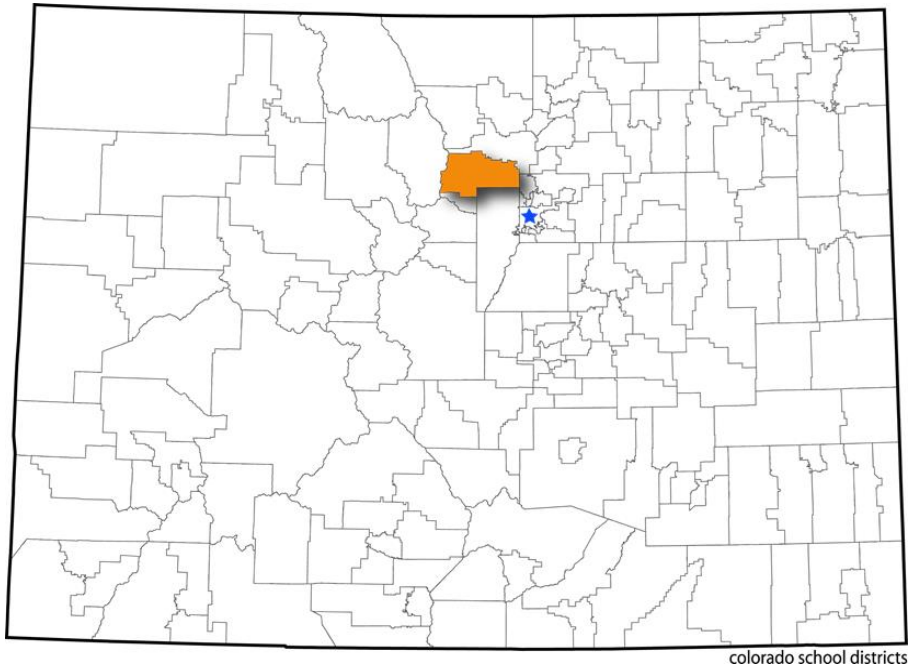
BOULDER VALLEY
SCHOOL DISTRICT

June 2022

Efficient and Healthy Schools

Ghita Carroll, Sustainability Coordinator, BVSD
Jeff Medwetz, Project Director, School District of Manatee County FL
(former BVSD Project Manager of Energy Systems)

BOULDER VALLEY SCHOOL DISTRICT



500 Square Miles

4.8M square FEET

65 BUILDINGS

72% of buildings 30+ years old

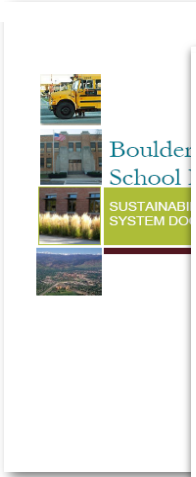
OLDEST: 1882 | NEWEST: 2017

65 ACRES of grounds

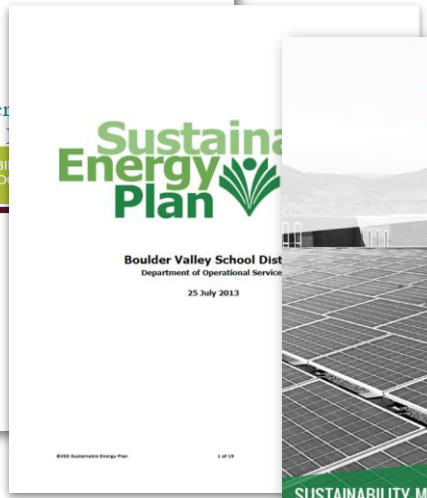
$6.6M ANNUAL utility spend

30,000 Students

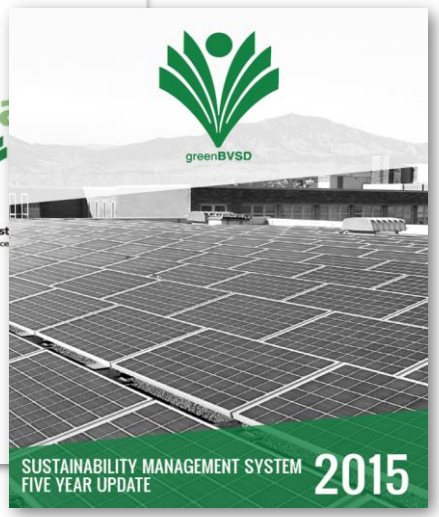
Sustainability Planning



2009 SMS

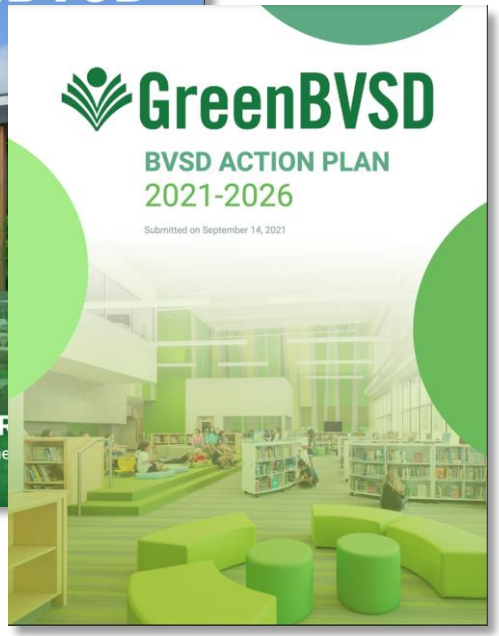


2013 Energy Plan



2015 SMS Update

2021 Progress Report



2021 Action Plan

New Vision and Mission

Vision

All together, for all students, and the planet

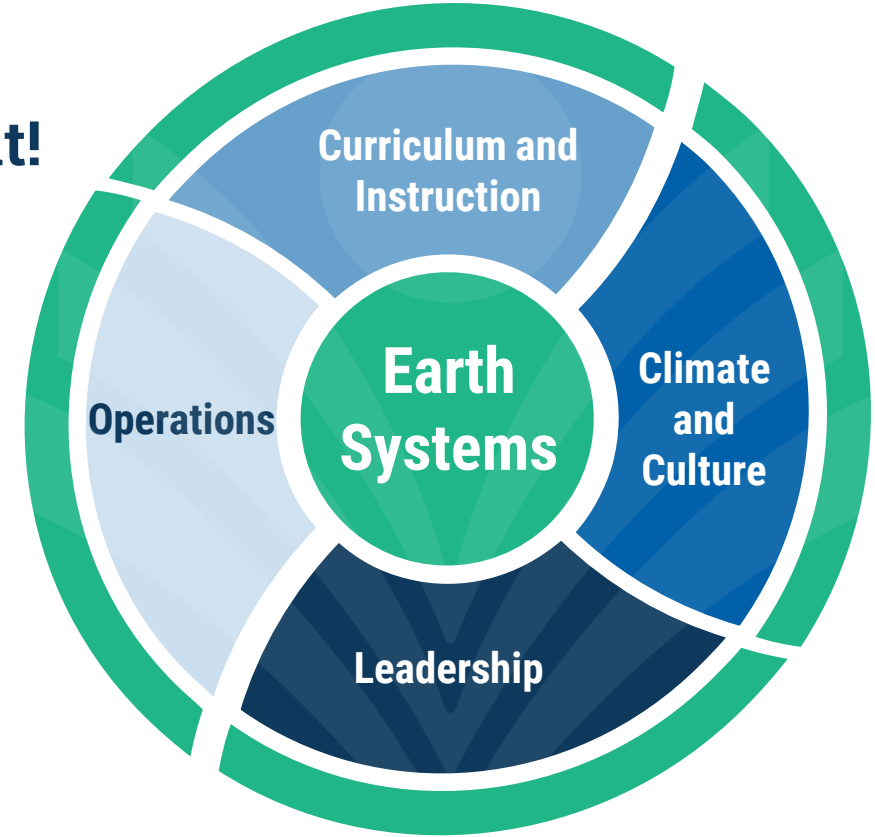
Mission

As a leader in whole-district sustainability, Boulder Valley School District creates healthy learning environments and experiences that equip all students and staff with the knowledge and skills to create more equitable and sustainable communities.

New Focus Areas

This new plan looks different!

- Previous plans have focused primarily in Operations.
- The new plan expands to cover all four of BVSD's impact systems.
    - Overarching goal and 3-5 supporting goals
- 5-year timeline



IAQ Brief Overview

- Opportunity with the Bond
- Partnership with University of Tulsa & University of Colorado
  - Tracking and evaluating
- District Indoor Air Quality (IAQ) Advisory Team
  - Response mechanisms

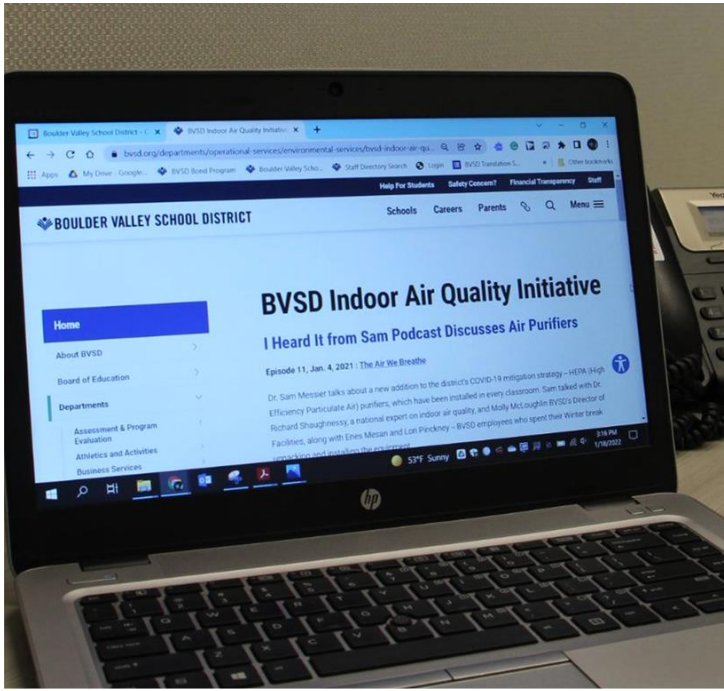
BOULDER VALLEY SCHOOL DISTRICT

Specific Strategies

- Leadership in Energy and Environmental Design (LEED) checklist
  - Maximize IEQ points
- Heating Ventilation and Cooling (HVAC) work in most buildings
- Purge clutter
- New guidelines (plants, furniture, etc.)

Indoor Air Quality Advisory Team

- Purpose
  - Disseminate information
  - Register complaints
  - Communicate regarding issues
- Membership
  - 19 members
  - Committee leadership
- Background/website



Advisory Team Accomplishments

- IAQ Liaisons
- Recommendations for renovated spaces
- Recommendations for response/process to IAQ issues
- Integrated Pest Management and IAQ language for standard operating procedures
- Green cleaning practices and non-toxic products
- Support and feedback for COVID procedures

Multi Year IAQ Study

- Pre-renovation audits
  - 2016-17, 2017-18, 2018-19
- Post-renovation audits
  - 2019-20, 2020-21, 2021-22
- Summary of results

Measurements/observations recorded in BVSD

- **Phase 1 & 2 data from 32 schools (Pre- & Post- Renovation)**

1. Monitoring and measurements

A. Continuous monitoring of CO2, T, RH (school occupied hours)
- Compared to standards for ventilation and thermal comfort

B. Assessment of cleaning effectiveness using adenosine tri-phosphate (ATP) sampling on classroom desks*
- A minimum of 30 samples per school pre- and post-cleaning
- Examine changes between pre- and post-.

2. Walkthrough / observations & spot checks

A. Standardized checklists based on US EPA's Tools for Schools kit

3. Staff Survey assessments

* ATP is a marker for degree of biocontamination on a surface

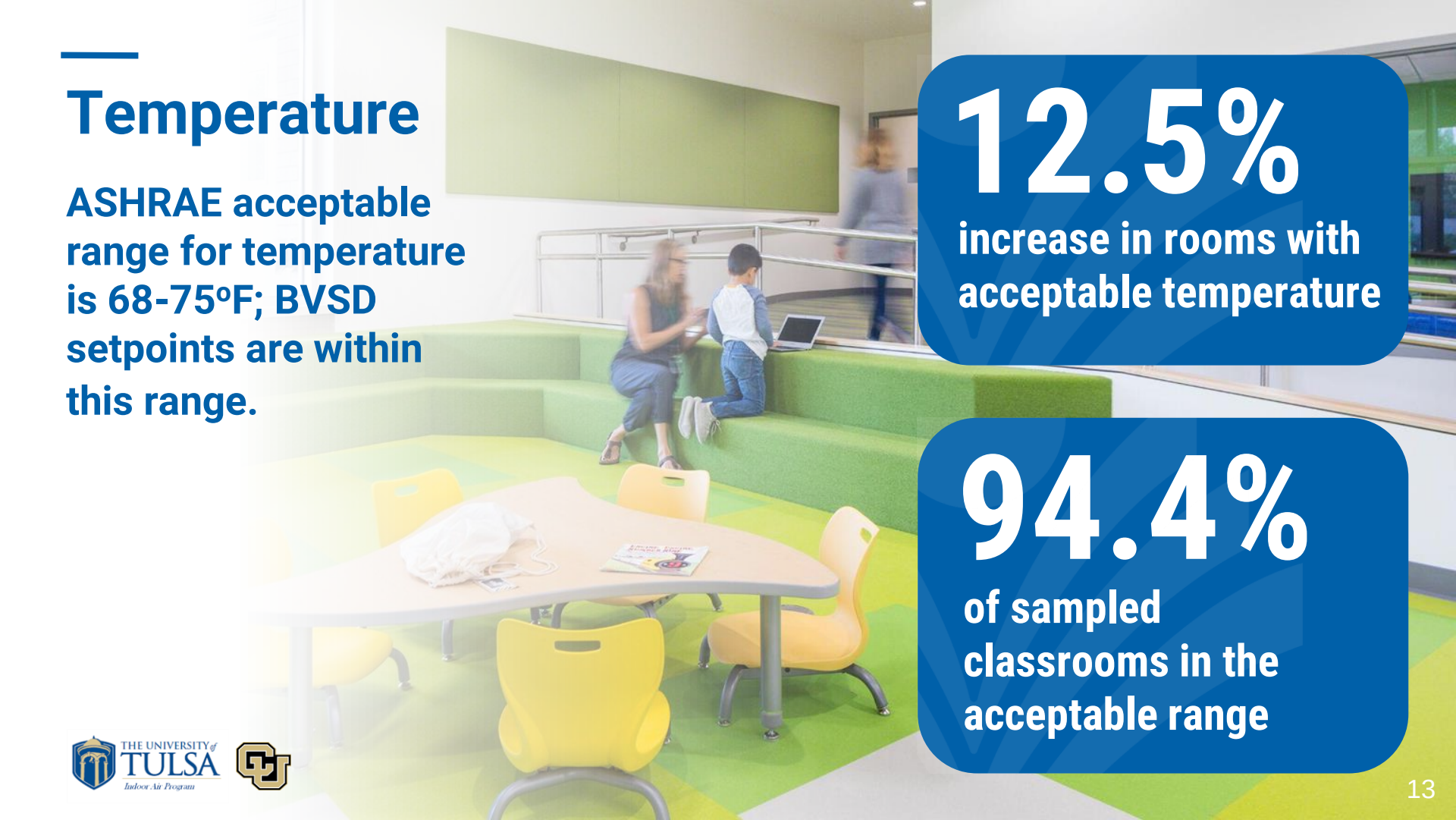
THE UNIVERSITY of TULSA Indoor Air Program

Interpretation of the measurement data.

Rating	T [°F]	RH [%]	CO_2 [ppm]	ATP [RLU]
Acceptable	68 ≤ T Needs ≤ 75	30–60	< 1200	≤ 5399
Needs improvement	75 < T ≤ 79	20-30	1200-2000	5400-17300
Poor	T < 68, T >79	RH < 20, RH > 60	> 2000	≥17301
Interpretation based on current standards or recommendations	ASHRAE recommends indoor temperatures (T) in the winter be maintained between 68 and 75°F, whereas summer temperatures should be maintained between 73 and 79°F.	Relative humidity (RH) should be about 30–60 % (EPA).	ASHRAE Standard 62 recommends carbon dioxide (CO_2) concentration 700 ppm above the outdoor concentration as the upper limit. however, given new concerns due to COVID, recommendations are aimed to optimize system operation to provide increased outdoor air ventilation to lower the risk of airborne transmission of the disease.	The ISSA Clean Standard For K-12 Schools for classroom desks, post-cleaning indicates effective cleaning when ATP (Charm Sciences system) reading is ≤ 5399 RLUs, needs improvement when 5400 to 17300 RLUs, and ineffective cleaning when ≥17301 RLUs.

Temperature

ASHRAE acceptable range for temperature is 68-75ºF; BVSD setpoints are within this range.



12.5%
increase in rooms with acceptable temperature

94.4%
of sampled classrooms in the acceptable range

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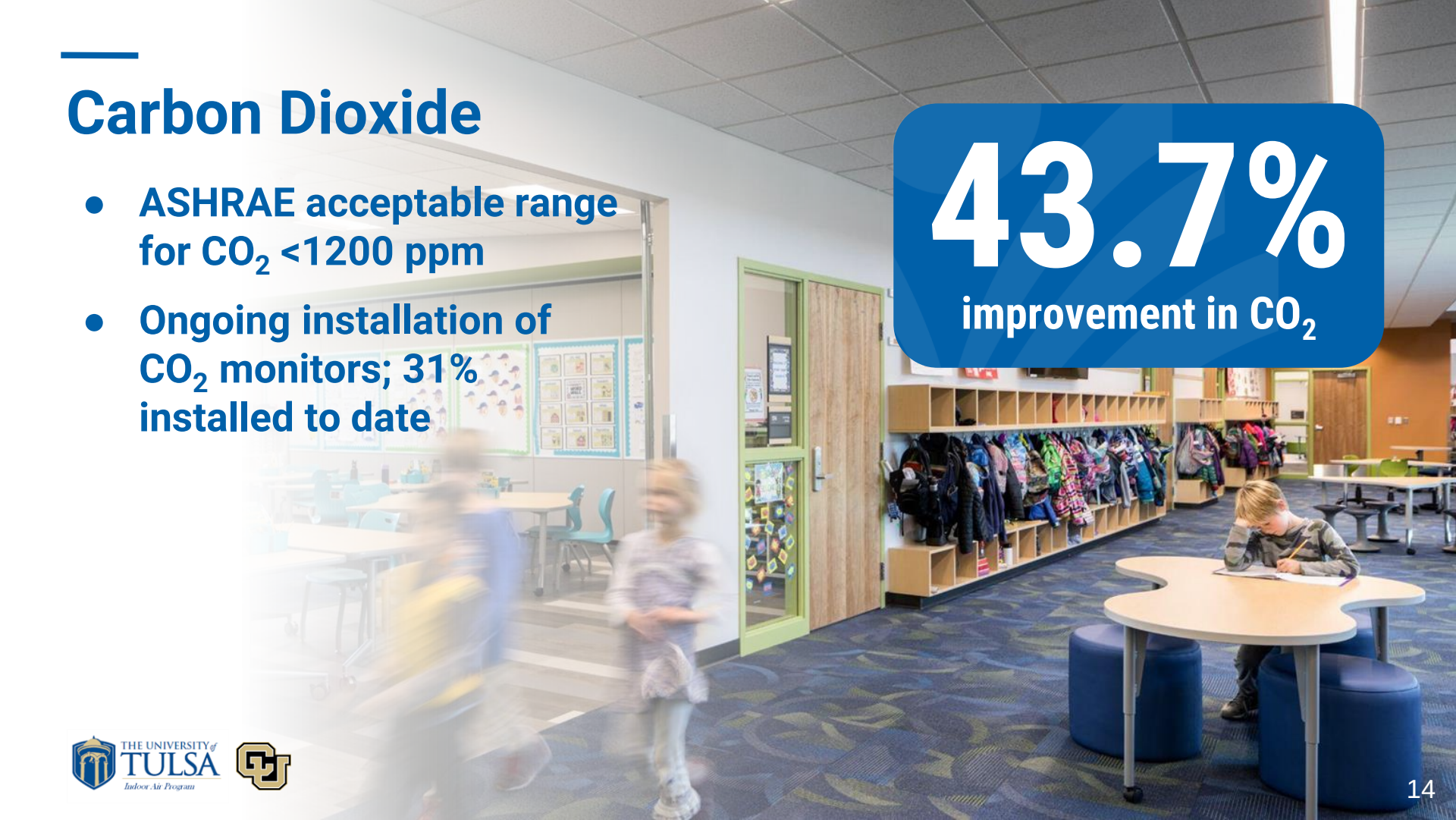
Indoor Air Program

Carbon Dioxide

- ASHRAE acceptable range for CO_2 <1200 ppm
- Ongoing installation of CO_2 monitors; 31% installed to date



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Indoor Air Program

ATP (cleaning)

The ISSA Clean Standard for K-12 Schools indicates effective cleaning when ATP ≤ 5399 RLUs

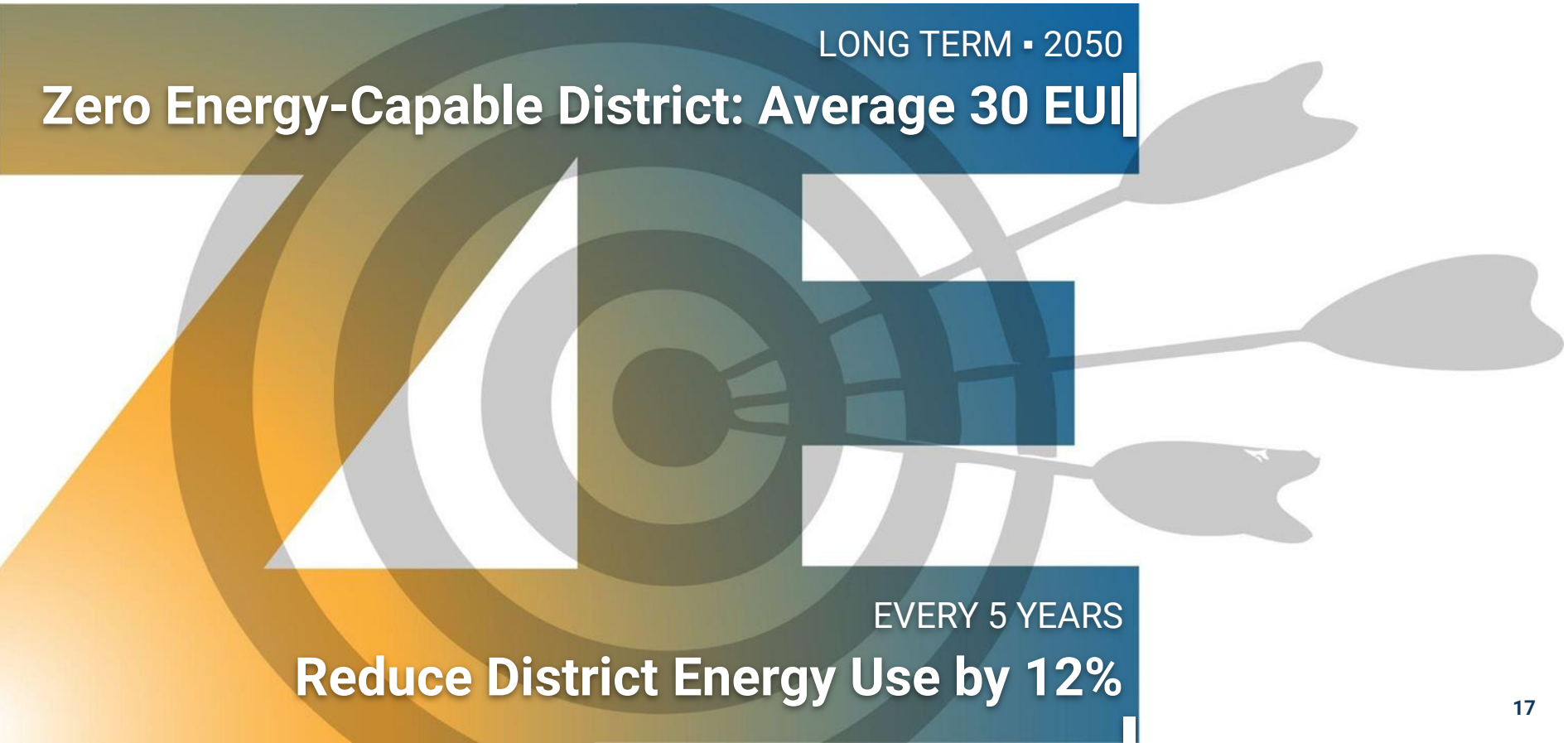
Clear
Reduction
in ATP levels post-cleaning

THE UNIVERSITY of TULSA
Indoor Air Program

Moving Forward

- Continuing education efforts
- Increased awareness
- Adjusting systems
- Informing policy and practice
- Continuation of phase 3 of the Indoor Air Quality work
- Final report 2023

District Energy Goals



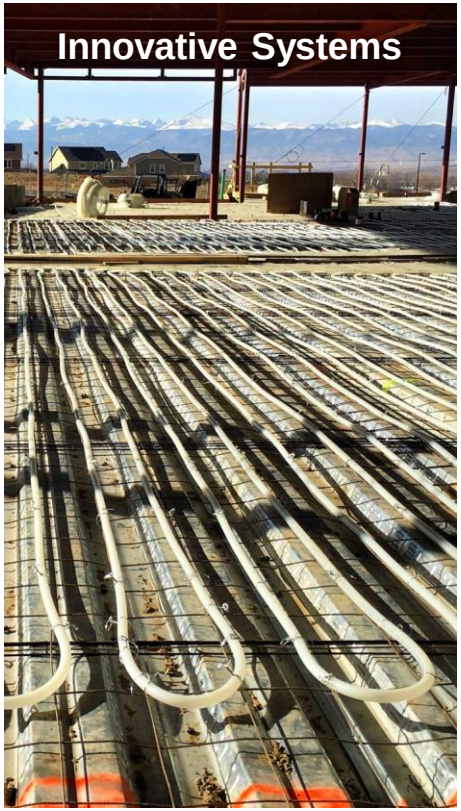
LONG TERM ▪ 2050

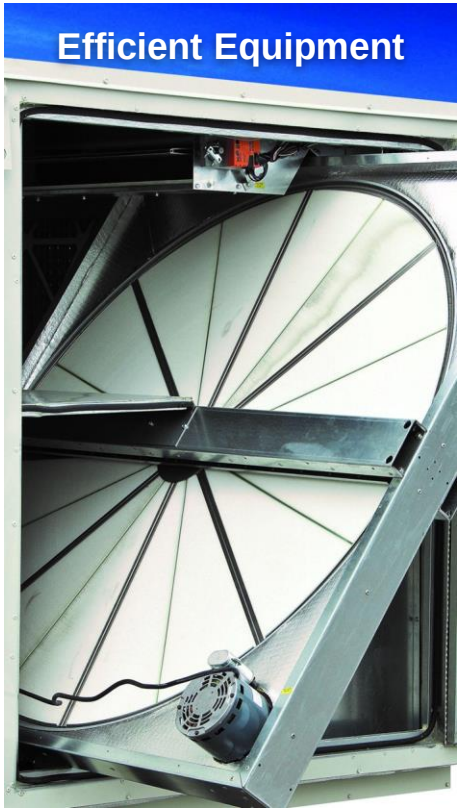
Zero Energy-Capable District: Average 30 EUI

EVERY 5 YEARS

Reduce District Energy Use by 12%

General Strategies



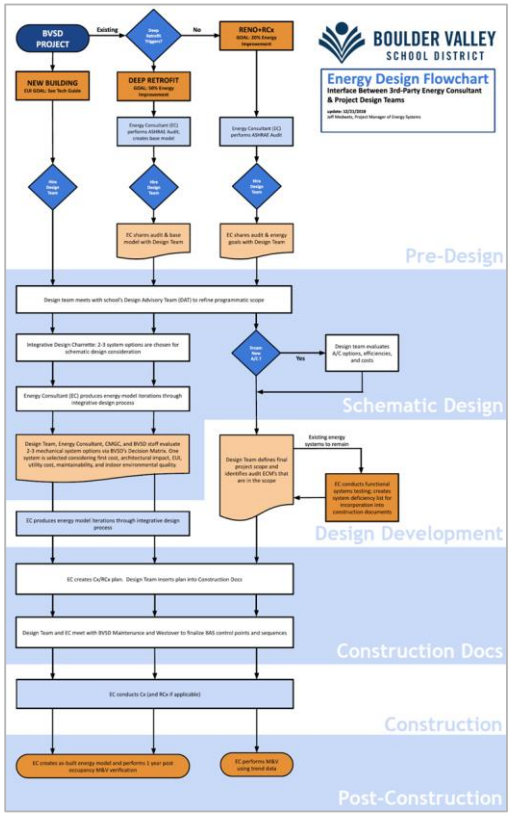


Strategy: HVAC System Decision Matrix

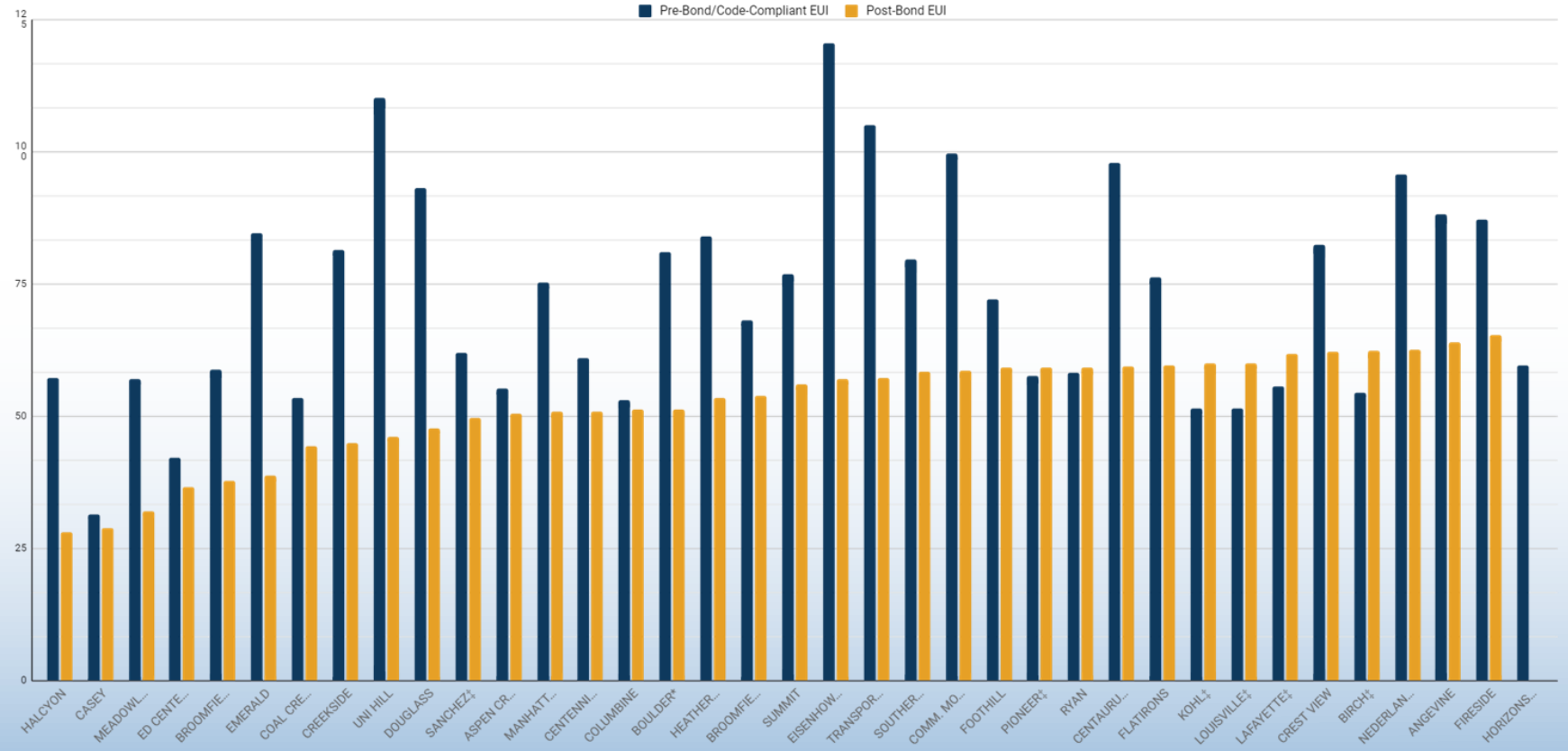
Mechanical System Selection Matrix for Facility Design

New Vista High School BVSD	Option 1	Option 2	Option 3
	Chilled Beam + Indirect Evap Commons	Chilled Beam + CHW Commons	FCU + Evap Commons
MECHANICAL SYSTEM FIRST COST	$4,093,700	$4,047,600	$3,987,800
FUTURE PROOFING (antipated annual energy cost)	$59,145.00	$59,620.00	$61,759.00
Standard Schedule	$56,889	$57,067	$54,359
Full Schedule	$59,145	$59,620	$61,759
EUI (full schedules)	25.60	27.10	25.70
MAINTAINABILITY Consider parts availability, relative system complexity, and ease of repair.	8.333	8.556	3.778
CONSTRUCTABILITY Consider the impact on construction schedule, building structure.	6.667	6.778	4.889
INDOOR ENVIRONMENTAL QUALITY Consider indoor air quality, level of mechanical acoustical noise, and thermal comfort.	8.556	8.111	4.444
FIRST COST Impact of mechanical system to the project construction budget.	9.734	9.850	10.000
FUTURE-PROOFING Impact to ongoing utility budget and ability to hedge against future energy price volatility.	10.000	9.920	9.558
ENERGY USE INTENSITY Consider the lowest EUI	10.000	9.941	9.996
TOTAL AVERAGE SCORE	8.882	8.859	7.111

Strategy: Energy Consultants / Commissioning



Results - 24% Average Efficiency Improvement



BOULDER VALLEY
SCHOOL DISTRICT

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https://www.bvsd.org/departments/operational-services/sustainability\

Jeff Medwetz, Project Director, School District of Manatee County FL
(former BVSD Project Manager of Energy Systems)
medwetzj@manateeschools.net
941.708.8800 x 44061

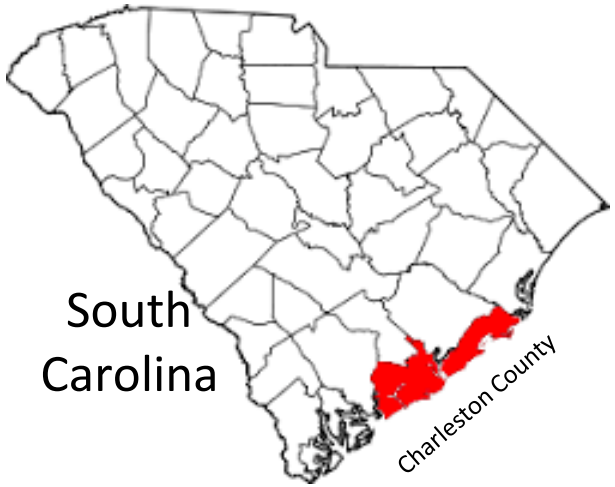
Team Approach To Energy Efficiency & IAQ Excellence

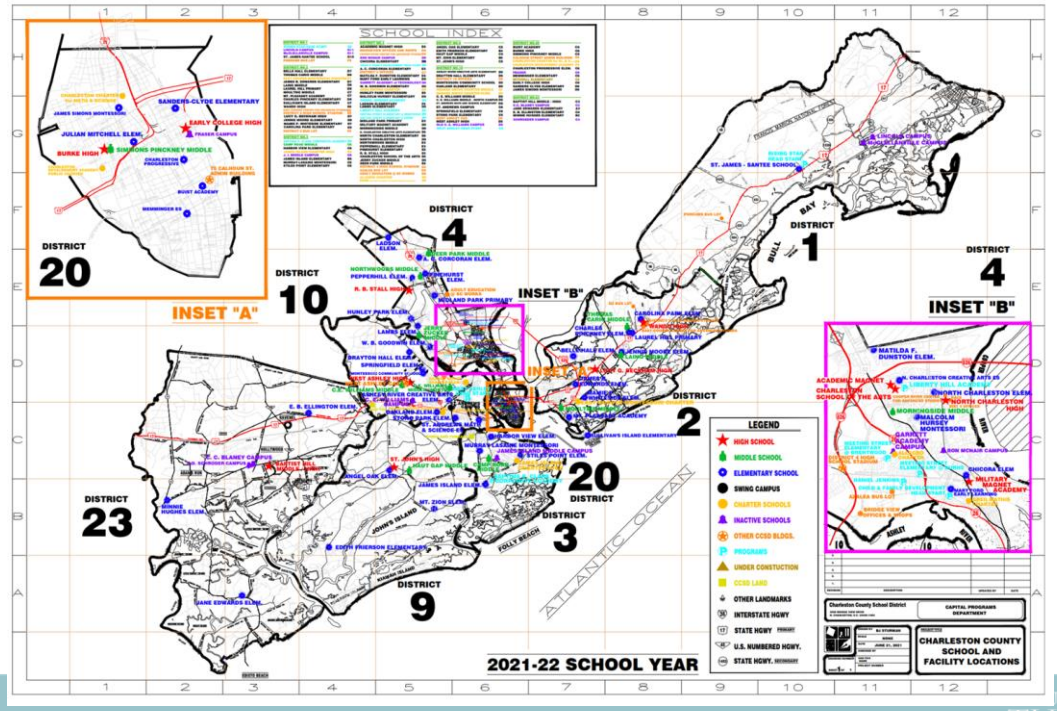
Ron Kramps, PE, CEM

Associate of Facilities Management

Charleston County School District, SC

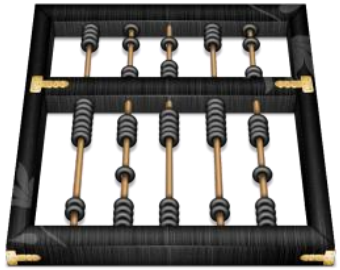
Charleston County School District





CCSD Facility Information

- 88 Schools, charters, programs
- 24 Head Start, leased, storage, admin, land, bus lots, stadiums
- 112 Properties/Campuses
- 10 MSF
- ~50,000 students

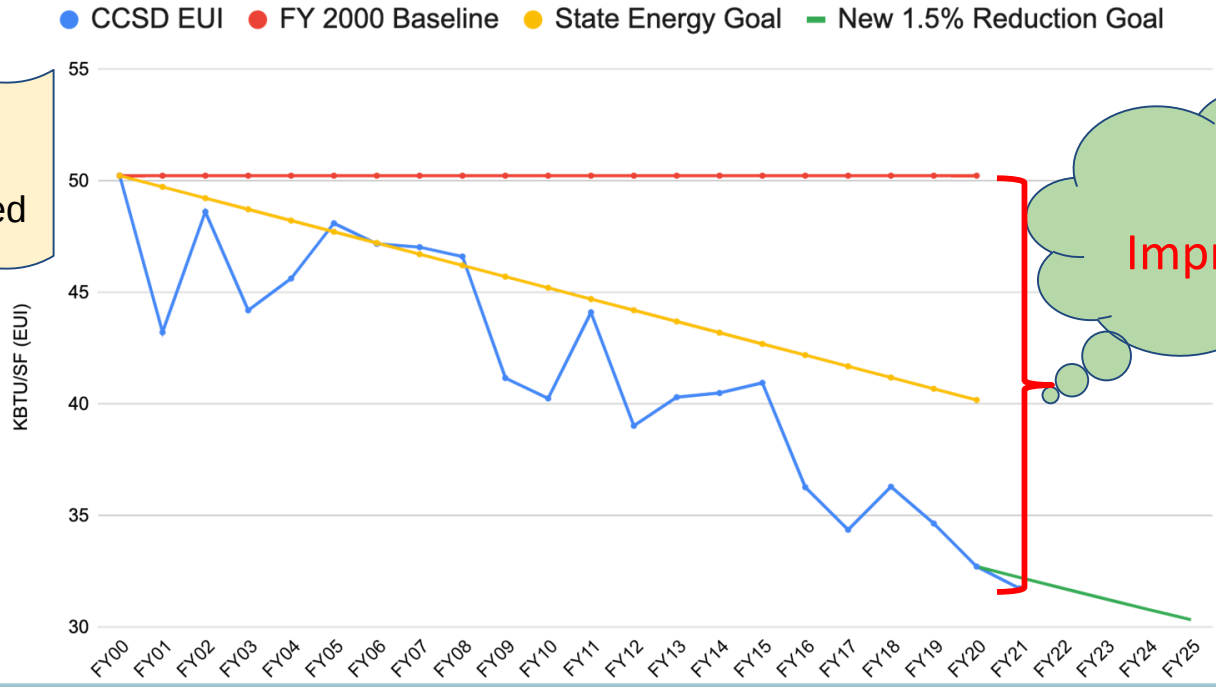


Charleston belongs to "Council of the Great City Schools" - ~70 largest urban districts

CCSD EUI Tracker

1% per year Goal

1.5% per year Achieved



37% Improvement

Team Focus: Purpose & Mission

- Purpose (why): To provide safe, healthy, comfortable, pleasant facilities that work all the time and enhance learning.
- Mission (how): Anticipating facility needs and meeting those needs before they become obvious.

Why are we here? How are we most effective

Team Mindset: Facility Asset Management

- Facilities are assets, useful for producing educated students
- You must designate “Asset Managers” who are charged with understanding and owning their assets, i.e. HVAC, restrooms, playgrounds, security systems…
  - List/quantities
  - Condition
  - Maintenance requirements
  - Cost to maintain
  - Desired specs for new
  - Annual “Status of Assets” presentation to leadership

Without a clear sense of “ownership” facilities will not be properly managed!

Who Supports Energy Efficiency & IAQ Excellence? Who Doesn't!

- Custodial: clean indoor environments; promotes integrity of envelope
- Grounds: landscapes & features to limit flooding & dirt migration
- Engineers: design/upgrade various building elements for efficiency
- Planners: biennial condition assessment to map out improvements
- Roof Program: cleans, inspects, repairs to keep moisture out
- Prev Maintenance: filter changes & efficient gear operations
- Controls Vendor: maximizes efficiency through automation
- Energy Program: facility audits to assess compliance

Daily tasks that support energy conservation & IAQ!

Engender Tenant Support

- Energy “Regulations” establish best practices and checklists for compliance
- Seven annual audits of facilities by controls partner
- Audits before holiday breaks and several unannounced audits
- Incentives encourage cooperation
- Awards for compliance (by SF or occupant)
- About $350,000 paid out each year

Measuring Effectiveness

- Of course measure EUI (Energy Use Intensity)
- Of course audit your facilities for compliance
- But what about:
  - Number of roof leaks per month
  - Work order efficiency, i.e complete <7days, etc.
  - PM/TM ratio
  - Principal “report cards” for custodial & grounds work
  - Emergencies/MSF

Many Thanks!

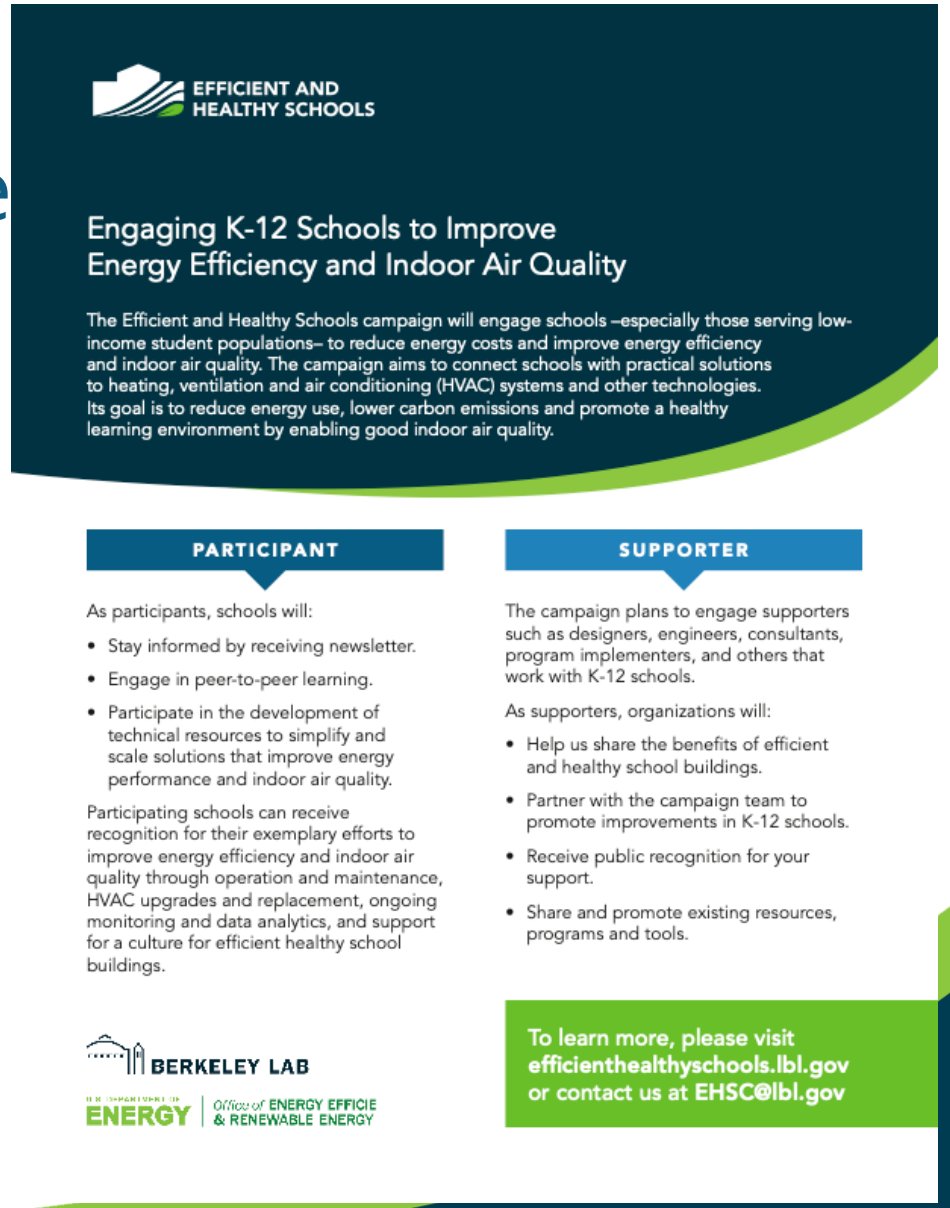
- Almost everyone has a role in energy efficiency and IAQ excellence.
- Establish purpose & mission.
- Establish asset management mindset.
- Explain roles and responsibilities (and never stop reminding!).
- Engender support from the tenants through incentives.
- Enjoy safer, healthier, more pleasant facilities!

Q&A

Contact us at EHSC@lbl.gov

Become a Participant or Supporte

- Access technical assistance and resources on best practices, guidance, case studies, and webinars
- Campaign prioritize schools serving low-income communities and in rural areas
- Campaign participants can receive recognition for their exemplary efforts to improve energy efficiency and indoor air quality
- Campaign supporters are encouraged to share and promote goals and benefits of efficient and healthy schools



EFFICIENT AND HEALTHY SCHOOLS

Engaging K-12 Schools to Improve Energy Efficiency and Indoor Air Quality

The Efficient and Healthy Schools campaign will engage schools –especially those serving low-income student populations– to reduce energy costs and improve energy efficiency and indoor air quality. The campaign aims to connect schools with practical solutions to heating, ventilation and air conditioning (HVAC) systems and other technologies. Its goal is to reduce energy use, lower carbon emissions and promote a healthy learning environment by enabling good indoor air quality.

PARTICIPANT

As participants, schools will:

- Stay informed by receiving newsletter.
- Engage in peer-to-peer learning.
- Participate in the development of technical resources to simplify and scale solutions that improve energy performance and indoor air quality.

Participating schools can receive recognition for their exemplary efforts to improve energy efficiency and indoor air quality through operation and maintenance, HVAC upgrades and replacement, ongoing monitoring and data analytics, and support for a culture for efficient healthy school buildings.

SUPPORTER

The campaign plans to engage supporters such as designers, engineers, consultants, program implementers, and others that work with K-12 schools.

As supporters, organizations will:

- Help us share the benefits of efficient and healthy school buildings.
- Partner with the campaign team to promote improvements in K-12 schools.
- Receive public recognition for your support.
- Share and promote existing resources, programs and tools.

BERKELEY LAB

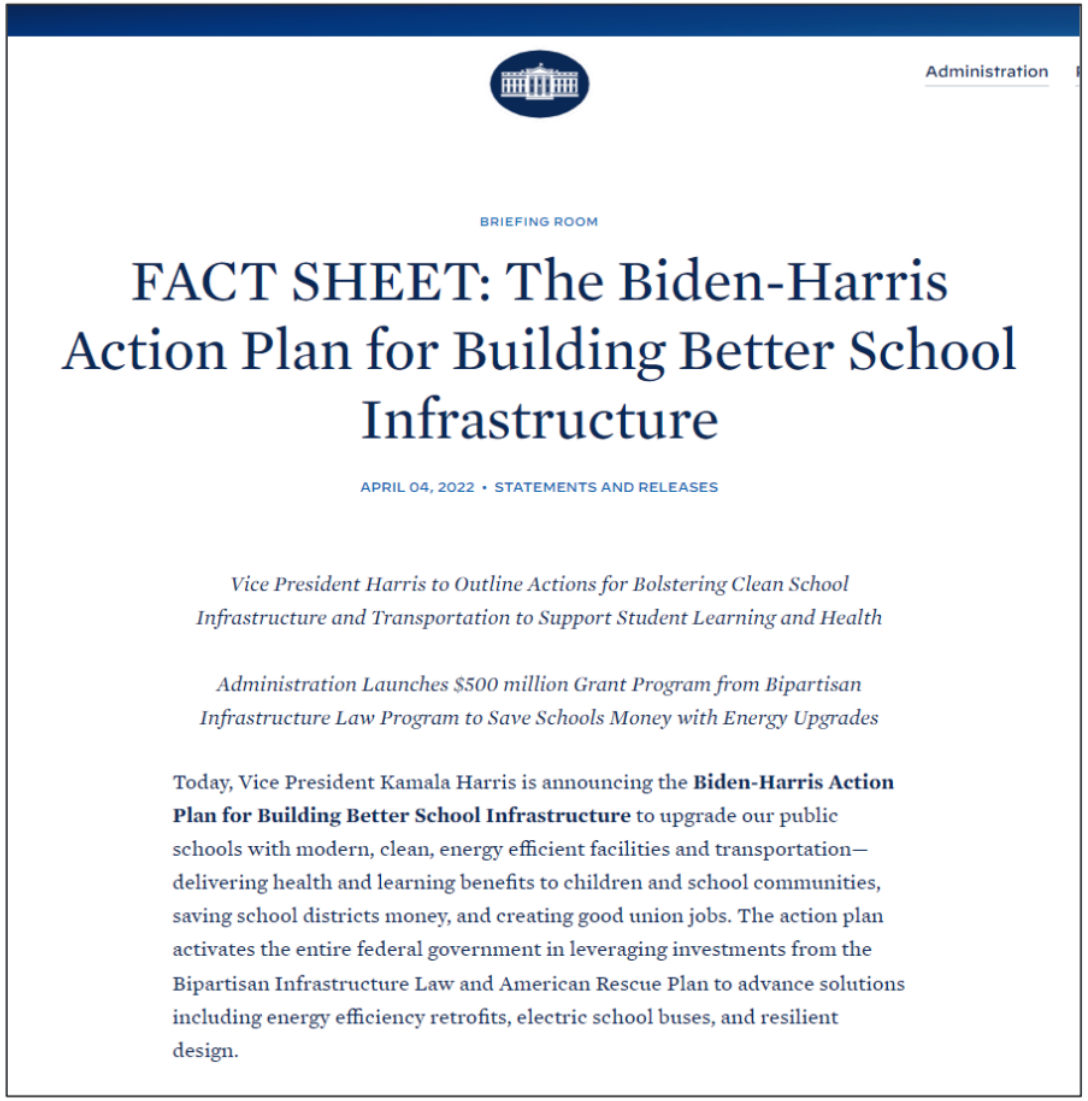
ENERGY | Office of ENERGY EFFICIE & RENEWABLE ENERGY

To learn more, please visit efficienthealthyschools.lbl.gov or contact us at EHSC@lbl.gov

DOE at Center of Building Better Schools Action Plan

The Biden-Harris Action Plan for Building Better School Infrastructure will:

Invest in More Efficient, Energy-Saving School Buildings: The Department of Energy (DOE) is launching a $500 million grant program through President Biden's Bipartisan Infrastructure Law to make public schools more energy efficient. This new program will lower energy costs, improve air quality, and prioritize schools most in need, enabling schools to focus more resources on student learning.



Administration

BRIEFING ROOM

FACT SHEET: The Biden-Harris Action Plan for Building Better School Infrastructure

APRIL 04, 2022 • STATEMENTS AND RELEASES

Vice President Harris to Outline Actions for Bolstering Clean School Infrastructure and Transportation to Support Student Learning and Health

Administration Launches $500 million Grant Program from Bipartisan Infrastructure Law Program to Save Schools Money with Energy Upgrades

Today, Vice President Kamala Harris is announcing the **Biden-Harris Action Plan for Building Better School Infrastructure** to upgrade our public schools with modern, clean, energy efficient facilities and transportation—delivering health and learning benefits to children and school communities, saving school districts money, and creating good union jobs. The action plan activates the entire federal government in leveraging investments from the Bipartisan Infrastructure Law and American Rescue Plan to advance solutions including energy efficiency retrofits, electric school buses, and resilient design.

Upcoming webinar: July 2022

- Efficient HVAC for improving indoor environmental qu

GREENVILLE COUNTY SCHOOLS
Inspire | Support | Prepare

RTU Replacement ISP Toolkit

The Rooftop unit (RTU) replacement package includes a high-efficiency RTU, advanced controls based on ASHRAE Guideline 36, and energy monitoring. Optionally and where appropriate, the package also includes window films and cool roofs to reduce the RTU load and size.

Each integrated systems package (ISP) includes a set of efficiency measures that are commercially proven and amenable to standardization.

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kW ENGINEERING