

Efficient and Healthy Schools Campaign



Lawrence Berkeley National Laboratory
Cindy Regnier, FLEXLAB Executive Manager, Whole Bldg Systems Dept Head
cmregnier@lbl.gov
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Project Summary

Objective and outcome

The Efficient and Healthy Schools Campaign aims to engage K-12 schools - especially those serving low-income populations and in rural areas - to reduce energy costs and improve energy efficiency, health, and resilience. The Campaign provides technical assistance and resources to help improve school facilities.

Team and Partners

LBNL (lead)

Campaign organizing partners: US Dept of Education, US EPA

Subcontractors: NBI, ACEEE, ASHRAE

Collaborators: BIE/FEMP/PNNL, Center for Green Schools (USGBC)



Stats

Performance Period: 6/1/2021 - TBD

DOE budget: FY21 - \$0.3M, FY22 - \$2M, FY23 - \$2M

Cost Share: SCEP FY22 - \$0.05M, FY23 - \$0.2M, partner agency and school time contributions

Milestone 1: Provide technical assistance (TA)

Milestone 2: Case studies for demonstrations

Milestone 3: Campaign recognition event

Problem Statement

- COVID-19 highlighted underinvestment in public schools, which are vital part of our infrastructure, and underscored critical ventilation needs.
- Majority of school facilities have poorly maintained HVAC systems and deferred maintenance.
- Lack of capacities and resources particularly acute in underserved communities, such as Title I schools and schools in rural areas.



The Efficient and Healthy Schools Campaign aims to engage and provide technical assistance, tools and resources, to K-12 schools maximizing energy, health, and resilience benefits through facilities improvements.

Alignment and Impact

Connection to 2035 Vision: Prioritizing **decarbonization of a historically underserved commercial building type** that also serves core community needs including education and disaster preparedness. Maximize the **co-benefits of** decarbonization with **improved health and academic** outcomes.



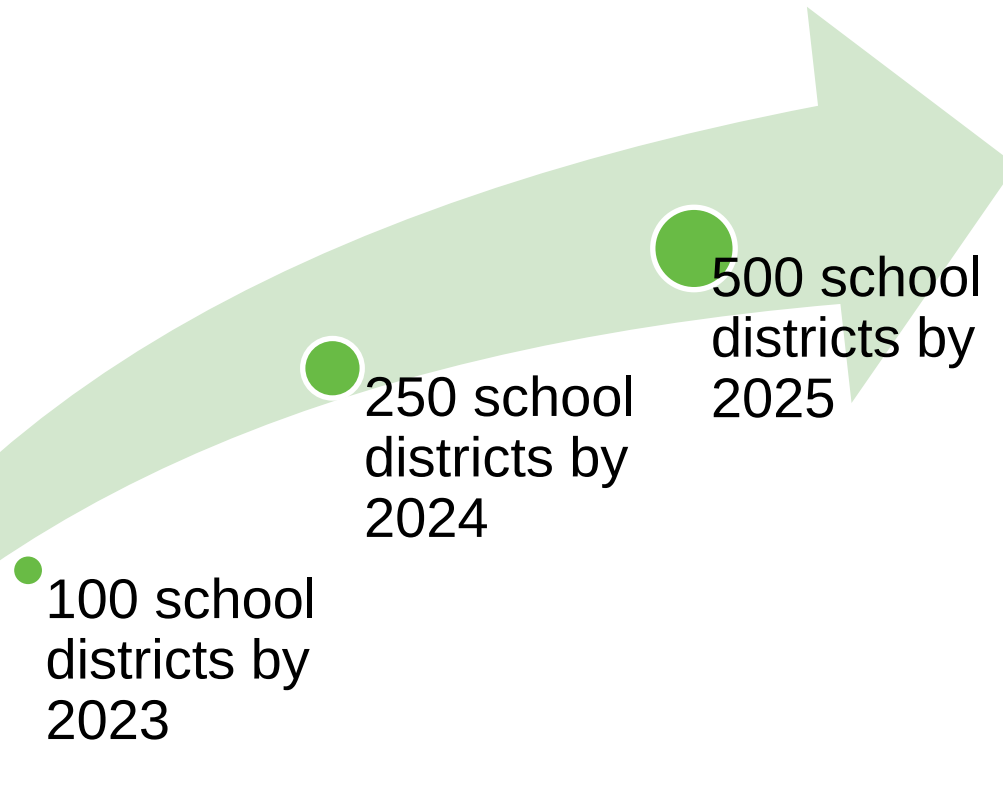
Energy Act 2020: A priority is coordinating and disseminating information on existing **Federal programs and assistance** that may be used to help initiate, develop, and finance energy efficiency, renewable energy, and **energy retrofitting projects for schools.**

WH.GOV



- Helping schools plan and implement indoor air quality improvements, including through use of Federal funds: Schools

Alignment and Impact



- 2025 Campaign goals:
 - Engage with 500 school districts, of which 20% are in rural areas
 - Engage with 25,000 schools, of which 40% are Title I schools
- FY2023 Key metrics:
 - Number of participants receiving technical assistance
 - Number of recognition submissions
 - Engagement with % Title I schools and rural districts

Approach - Focus Area and Objectives

Outreach and Engagement

- Raise awareness of capabilities, costs, benefits
- Recruitment of schools
- Recognition to highlight best practices

Tools and Resources

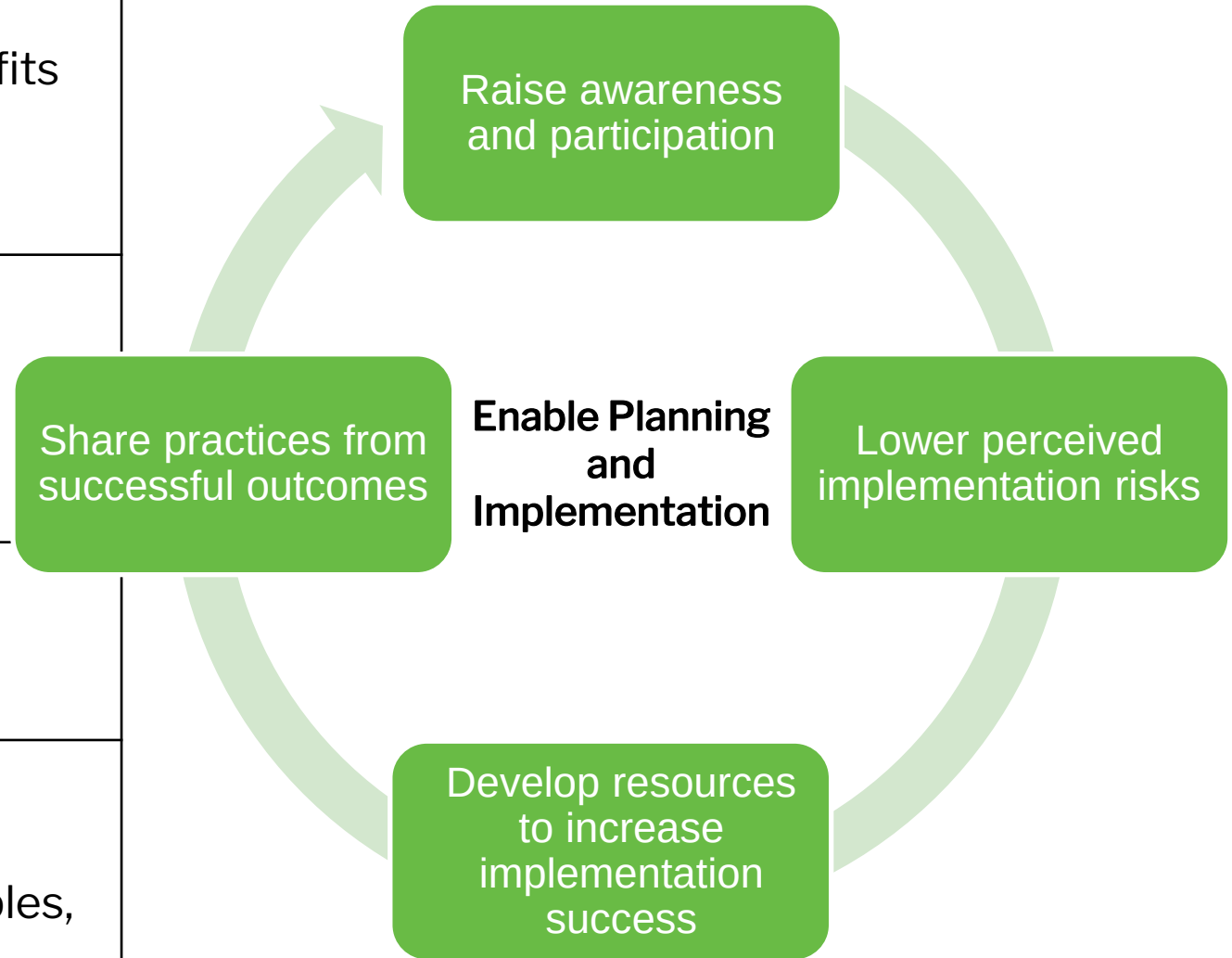
- Technical guides, e.g. retrofit packages
- Financing and support
- Webinars and case studies

Technical Assistance

- Direct support to schools
- To agencies and collaborators

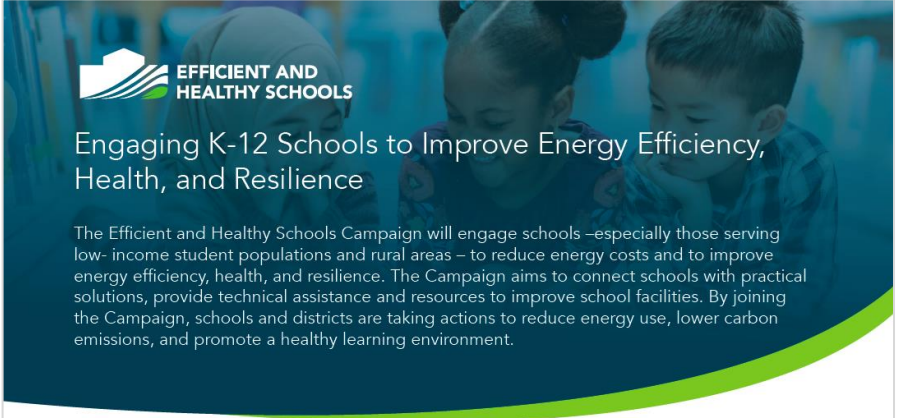
Demonstration Projects

- Reduce perceived technical risks
- Build public data and implementation examples, show benefits



Approach - Outreach and Recruitment

- Participants recruited through organizing partners (EPA, ED) newsletters and announcements
- Targeted recruitment through ED's rural program state coordinators and Green Ribbon Schools(ED) state coordinators
- Participants recruited through collaborators, such as ASHRAE, USGBC Center for Green Schools, National Council on School Facilities
- Leverage other DOE's campaigns and initiatives
- Webinars and networking events (e.g., Green Schools Conference)
- Mobilizing utilities as partners via ACEEE Working Group



EFFICIENT AND HEALTHY SCHOOLS

Engaging K-12 Schools to Improve Energy Efficiency, Health, and Resilience

The Efficient and Healthy Schools Campaign will engage schools –especially those serving low-income student populations and rural areas – to reduce energy costs and to improve energy efficiency, health, and resilience. The Campaign aims to connect schools with practical solutions, provide technical assistance and resources to improve school facilities. By joining the Campaign, schools and districts are taking actions to reduce energy use, lower carbon emissions, and promote a healthy learning environment.

PARTICIPANT	SUPPORTER
Joining the Campaign is easy and free. As participants, schools will: • Receive technical assistance that meets your school and district's needs, including strategies to improve energy efficiency and indoor environmental quality, and utilize low carbon technologies. • Receive recognition for your efforts to improve energy efficiency, health, and resilience. • Stay informed by receiving newsletters and other resources on energy retrofits related topics. • Learn best practices from experts and peers through webinars and case studies.	The Campaign also 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. • Support schools in applying for recognition for their efforts to improve energy efficiency, health, and resilience. • Stay informed about best practices, tools and guidance on energy retrofits. • Share and promote existing resources and learning opportunities.

The Campaign is led by the U.S. Department of Energy, with technical support from Berkeley Lab. The Campaign was developed with contributions from the U.S. Department of Education and the U.S. Environmental Protection Agency.

BERKELEY LAB

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

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

Approach – Recognition Program

Year 1 (2021/2022) focused on HVAC and indoor air quality

- Inspection and maintenance
- Efficient HVAC technologies
- Monitoring and analytics
- Team approach for strategic planning

Year 2 (2022/2023) prioritizing broadly replicable approaches

- Two categories: (1) Energy efficiency plus health and (2) Emissions reduction and resilience
- Two tracks to increase participation: planning and implementation



Approach – Tools and Resources

Feature technical tools and guides

STANDARD

ANSI/ASHRAE/ACCA Standard 180-2018
(Supersedes ANSI/ASHRAE/ACCA Standard 180-2012)

Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems

Approved by ASHRAE on June 11, 2018; by the Air Conditioning Contractors of America on May 13, 2018; and by the American National Standards Institute on June 11, 2018.

ASHRAE® Standards are scheduled to be updated on a five-year cycle; the date following the Standard number is the year of ASHRAE approval. The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2335. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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Retrofit package planning and design guides

Signposting to funding opportunities for energy retrofits



The U.S. Department of Energy recently announced more than \$80M, the first tranche of funding in a \$500M investment, to make clean energy improvements in K-12 public schools. Funds will empower school districts to make upgrades that will lower facilities' energy costs and improve student learning environments.

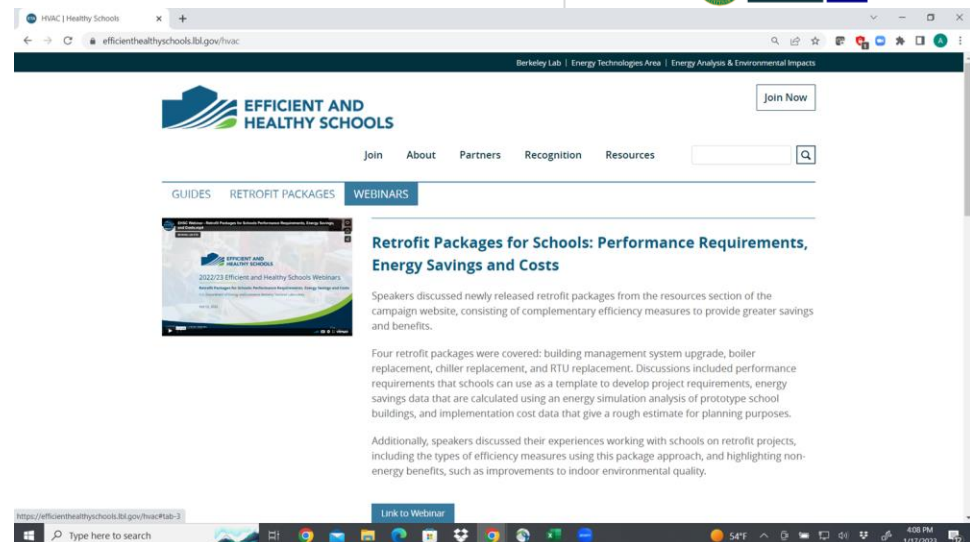
Read the Renew America's Schools Grant Notice of Intent

Learn about this first-of-its-kind facilities improvement program

Learn more about the Energy CLASS prize

Learn how this prize will empower schools to build capacity & make energy improvements

Webinars to showcase replicable retrofit examples



Approach – Technical Assistance and Demo Projects



Technical Assistance

- Onboarding interviews with participants to understand their needs
- Gather and track data from participants on facilities planning and retrofit efforts

Demonstration Projects

- Prioritize broadly replicable approaches
 - Provide schools with low-cost improvements, e.g. retrocommissioning, HVAC, controls
- At least one demonstration project in each of four States with many rural and tribal communities
 - Alaska, Arizona, Hawai'i, New Mexico

Progress and Future Work

104 Participants: 49 (Year 1) + 55 (Year 2, to-date)



Participants

- 20% participants from rural locale
- Participants represent 6,877 schools, of which 54% Title I schoolwide program eligible

Recognition

- 20 implementation submissions in Year 2, compared to 9 submissions from Year 1
- In addition, 30+ school districts attending planning track webinars

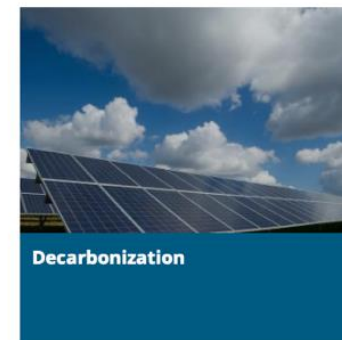
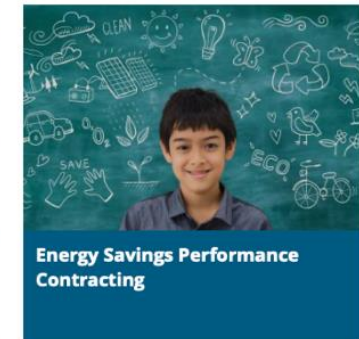
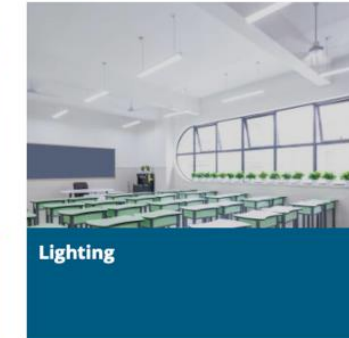
Progress and Future Work - Web Resources and Webinars

- Resources web page featuring 9 areas, including retrofit approaches, financing, and case studies

<https://efficienthealthyschools.lbl.gov/>

- Webinars hosted by the Campaign

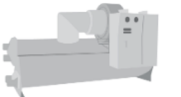
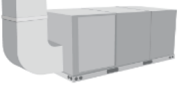
	Number of Registration	Number in Attendance
Year 1: Four webinars (May-July 2022)	857	544
Year 2: Five webinars (Oct 2022-Feb 2023)	914	506



Progress and Future Work - Tools and Resources

School needs and benefits assessment resources

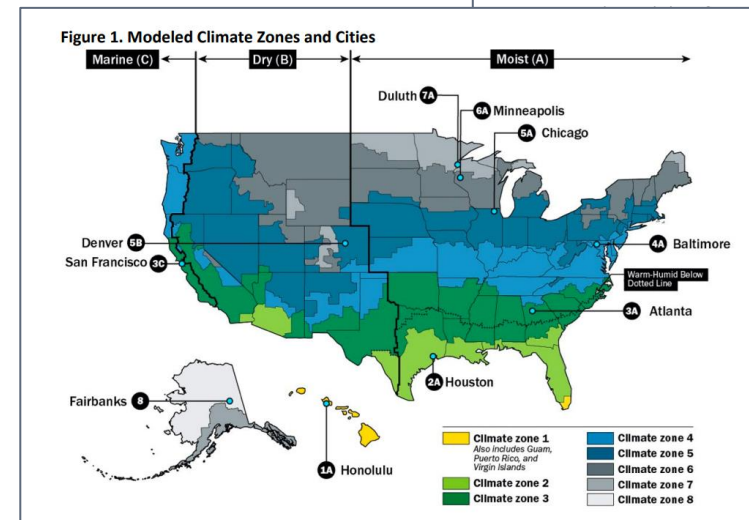
- Modeling of retrofit packages for prototypical schools
- School Energy Assessment (SEA) form

Location 1: First look in the mechanical room (if you have one) to determine if you have central plant equipment. You will see one or more of the following:	Check the box for all equipment you see
Chiller - You will see a long cylinder tube or something that looks like a reciprocating engine in a car, depending on the type of chiller. - Larger chillers will be connected by piping to a cooling tower (water-cooled) outside of the building or vertical fans (air-cooled) outside the building.	 ☐
Boiler - A boiler will provide heat in the mechanical room when on, increasing the temperature in the room. You will see an exhaust duct from the boiler. - The burner will be in front of the boiler, with a flame if it is on. - You will see wires and pipes on the exterior.	 ☐
Warm Air Furnace - This is usually vertical, with a distribution duct and exhaust duct coming out of it. - You'll see a vent on the side or the front.	 ☐
Air Handling Unit (AHU) - This is in the mechanical room. - You can see something that looks like a hood vent for outside air. - You will see ductwork to it (return air) and ductwork that goes to other parts of the building (supply air). - It will have hot water piping from a boiler for heating and chilled water piping from a chiller for cooling (see Location 1 for a boiler and chiller). - You will not see a fan. - For larger systems, there will be thermostats in rooms, controlling heating and cooling. - For larger systems, there will be a variable speed drive (VFD) on the wall of the mechanical room/space (see below in Location 1).	 ☐



Modeled Retrofit Package Performance for Prototype Schools Prepared by Lawrence Berkeley National Laboratory (LBNL)

This report details modeled energy performance and savings from retrofit packages in prototype school buildings in climate zones throughout the U.S. The information herein serves as a reference for elementary and secondary schools interested in implementing retrofit packages in their facilities for energy savings as well as health and safety benefits. Results include electric and gas savings from nine different retrofit packages that combine energy conservation measures including HVAC controls and equipment upgrades, lighting efficiency technologies such as heat pumps for space conditioning and energy reductions and annual energy cost savings are also



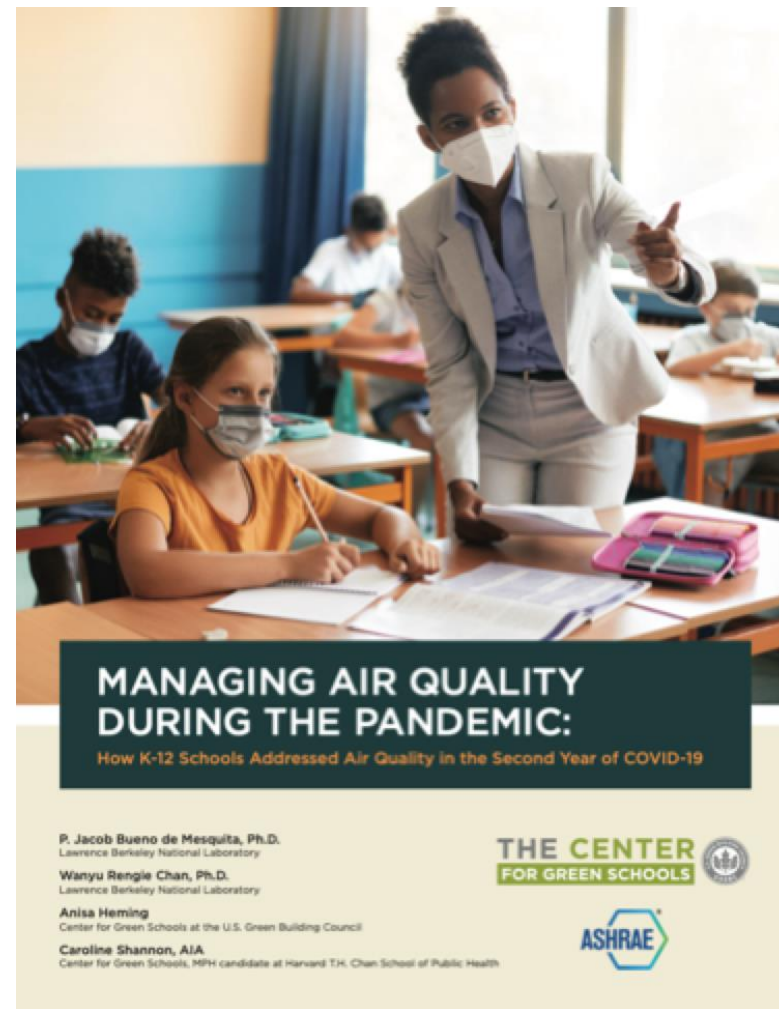
November 2022

Coordinating with utility partners to make multi-measure retrofit packages available to schools

Progress and Future Work - Supporting Indoor Air Quality

Collaborations with partners on school indoor air quality (IAQ):

- Designed survey to gather data on strategies to improve IAQ with USGBC Center for Green Schools
- Measure IAQ in Bureau of Indian Education (BIE) schools, in partnership with FEMP/PNNL
- Assist EPA regional office to draft a standard operating procedure for CO2 monitor loaner program
- Collaborate with a CDC-funded research project to study respiratory infection in schools, and the role of building factors (e.g., ventilation) on transmission



Progress and Future Work - Technical Assistance

Technical assistance provided by the Campaign:

- Energy benchmarking using EnergyStar Portfolio Manager
- Energy analysis of systems, e.g. changes to HVAC operation, PV production
- Review of design documents on building retrofits
- Resources on proven approaches to improve indoor air quality through ventilation, filtration, and air cleaning
- Connections with other DOE efforts, e.g., Integrated Lighting Campaign, Better Climate Challenge

Technical assistance expanding to these areas:

- Connecting schools with resources on solar, resilience, EV, and other topics
- Assist participants on creating plans to improve energy efficiency, health, and resilience



Progress and Future Work - Demonstrations

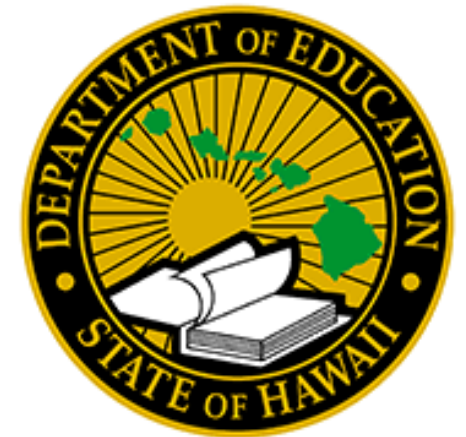
Alaska and Hawai'i demonstration project progress

- Coordinated with State Education Departments and other agencies
- Developed assessment criteria to prioritize sites
 - Title 1 / rural, approach replicable at other facilities
- Contacted priority sites from list based on selection criteria
 - Understand HVAC system needs and other improvement opportunities



Future work

- Install energy / IAQ sensors and data loggers to characterize existing baseline
- Conduct facility retrocommissioning or gather data and information on HVAC retrofit
- Explore opportunities for project replication



Thank You

Lawrence Berkeley National Laboratory
Cindy Regnier, Whole Building Dept Head
CMRegnier@lbl.gov
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REFERENCE SLIDES

Project Execution

	FY2021				FY2022				FY2023			
Planned budget	\$300,784				\$1,972,896				\$2,886,254			
Spent budget	\$139,734				\$1,034,107				\$720,882*			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Past Work												
Q3 Milestone: Design participation and recognition				◆								
Q4 Milestone, Go/No-Go: Recruit 10+ schools and districts				◆								
Q4 Go/No-Go: Technical guidance resource dev plan				◆								
Q4 Milestone: Draft technical specs				◆								
Q2 Milestone, Go/No-Go: Strategic partnerships						◆						
Q2 Go/No-Go: Campaign recognition categories						◆						
Q3 Milestone, Go/No-Go: School program analysis							◆					
Current/Future Work												
Q3 Milestone: TA for recognition participants											◆	
Q3 Milestone, Go/No-Go: Campaign recognitions announced											◆	
Q3 Milestone: Meet campaign participation goals												◆

*through February 28, 2023

- All milestones have been met to date.
- Spend rate slowed in FY22 and FY23 due to delays in identifying and getting approvals for demonstration projects. Spend rate expected to accelerate through remainder of FY23.

Team

Partner	Role
Berkeley Lab	Manage campaign
New Buildings Institute (NBI)	Provide program management support
ASHRAE	Outreach and Technical Assistance to key underserved markets
ACEEE	Coordinate with utilities
David Landman	Provide general technical assistance
kW Engineering	Provide general technical assistance
Energy Audits Alaska	Provide technical assistance to Alaska schools
MK Think	Provide technical assistance to Hawaii schools
Energy Works	Provide technical assistance to Arizona and New Mexico schools

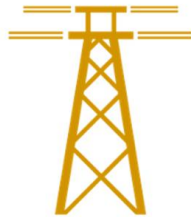
- Only members of the funded team are included. Additional project collaborators have been identified on previous slides.

EERE/BTO goals

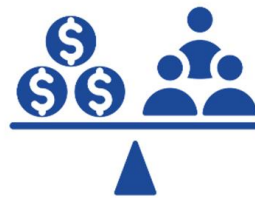
The nation's ambitious climate mitigation goals



Greenhouse gas emissions reductions
50-52% reduction by 2030 vs. 2005 levels
Net-zero emissions economy by 2050



Power system decarbonization
100% carbon pollution-free electricity by 2035



Energy justice
40% of benefits from federal climate and clean energy investments flow to disadvantaged communities

EERE/BTO's vision for a net-zero U.S. building sector by 2050



Support rapid decarbonization of the U.S. building stock in line with economywide net-zero emissions by 2050 while centering equity and benefits to communities



Increase building energy efficiency

Reduce onsite energy use intensity in buildings 30% by 2035 and 45% by 2050, compared to 2005



Accelerate building electrification

Reduce onsite fossil -based CO₂ emissions in buildings 25% by 2035 and 75% by 2050, compared to 2005



Transform the grid edge at buildings

Increase building demand flexibility potential 3X by 2050, compared to 2020, to enable a net-zero grid, reduce grid edge infrastructure costs, and improve resilience.



Prioritize equity, affordability, and resilience

Ensure that 40% of the benefits of federal building decarbonization investments flow to disadvantaged communities



Reduce the cost of decarbonizing key building segments 50% by 2035 while also reducing consumer energy burdens



Increase the ability of communities to withstand stress from climate change, extreme weather, and grid disruptions