Zeroing in on Energy Performance in New and Existing Schools

Amy Cortese, Mark Lyles and Reilly Loveland, New Buildings Institute
Mary Sutter, Grounded Research LLC

ABSTRACT

Schools are a clear early adopter to target for zero energy (ZE) performance across the United States because they can serve as exemplars to the public, teach students about energy, and lead to better educational outcomes for students. A ZE school uses as much energy as it produces over the course of a year. According to the largest dataset of ZE buildings, kindergarten through twelfth grade (K-12) schools represent 37% (110 buildings) of the total U.S. buildings verified or striving to operate at ZE (NBI 2018, 8). This represents less than 1% of the total U.S. schools.

This paper presents completed national research about decision-making, funding and energy practices in the K-12 schools new and existing buildings market. The paper confirms the obvious, that educational outcomes and student performance are the primary drivers of all decisions in the school market. It explains how benefits of ultra-low and ZE align with these educational outcomes and how energy can be woven into the fabric of current practices in schools.

The paper adds to the body of knowledge as it outlines three key barriers to ultra-low and ZE performance in the school market - lack of: (1) awareness, (2) processes and (3) dedicated funds for energy efficiency and provides recommendations on how to strategically overcome each barrier. These recommendations are aimed at the multiple market actors involved with designing and retrofitting K-12 schools, from state agencies, to local school boards, design professionals and finally how publicly funded energy efficiency programs can support the path to ZE in schools.

Introduction

Since the inception of the US Green Building Council's (USGBC's) Leadership in Energy and Environmental Design and the Collaborative for High Performance Schools (CHPS) rating systems, the education sector has embraced the concept of sustainable, high performance schools especially in new construction activities. A significant body of research demonstrates the direct impact that these facilities have on student and teacher health, performance, productivity as well as in overall district financial health and liability. In the 2006 CHPS Best Practices Planning Manual, CHPS summarizes the benefits of sustainable, high performance schools including: higher student test scores, reduced operating cost, increased daily attendance, enhanced teacher performance and satisfaction, reduced environmental impact, increased building life and reduced liability for district (CHPS 2006, 2-10).

ZE schools espouse many of these same attributes of sustainable, high performance schools. However, ZE schools go a step further in the energy category, using only as much energy over the course of the year as they can produce with renewable energy systems. While ZE definitions vary (for example, whether the energy use is defined with a boundary around the building site or if the boundary goes back to the primary energy source), one commonality is that successful ZE buildings and schools prioritize energy efficiency (Torcellini, et al., 2006). The 2018 Getting to Zero Project list suggests that ZE schools with measured performance data (i.e. "ZE-verified") have a median site Energy Use Intensity (EUI) of 18 kBtu/square foot-year, and emerging projects (those in design, construction or without at least twelve months of operating data) have a median EUI of 27 kBtu/square foot-year as seen in Figure 1 (NBI 2018, 20-33).

Typical schools have an EUI of 58 kBtu/square foot per year, so these ZE-verified and ZE-emerging schools outperform others by 53- 69% (CBECS 2012).

Figure 1: Site Energy Use Intensity of Verified and Emerging ZE Schools (NBI 2018)
Note: ZE-verified = verified energy use; ZE-emerging = absent 12 months of data or in construction

This paper explains how a concerted effort to overcome identified barriers might accelerate market transformation toward ultra-low energy EUI targets that put ZE within reach for many K-12 schools. The summary and recommendations are based on a detailed review of secondary research, 22 in-depth interviews of market actors in California as well as the completion of three focus groups with 15 national participants hosted by NBI and the U.S. Department of Energy's Zero Energy Accelerator Program at the 2017 USGBC Center For Green Schools Green Schools Conference and Expo in Atlanta, GA.

Aligning Zero Energy to Educational Outcomes

The benefits of sustainable, high performance schools have been carefully researched and documented. Students spend approximately 1,000 hours per year in school buildings (Hull & Newport, 2011), so transforming classrooms into healthy and productive spaces is of the utmost importance, especially when the long-term and short-term health of students and staff is at risk (Mendell, 2016). Many ZE schools feature both the passive ventilation systems such as natural ventilation, dedicated outdoor air systems and demand-control ventilation along with daylighting strategies that enable these benefits.

In addition to the health benefits, qualities of ZE learning spaces offer students a leg up on academic success. The next generation of schools will house our future governmental, business, and environmental leaders and warrant investments in classrooms designed to encourage student performance at the highest standards. Students themselves understand the positive outcomes of hands-on opportunities that give them practical experience. This can be delivered through the "bricks and mortar" of the school itself. Using the building as a tool for energy literacy, supported by curriculum integration, can deliver the societal changes necessary to be responsive to energy goals for 2030 and beyond.

While the non-energy benefits of ZE schools are important, cost avoidance due to lower energy bills is a compelling driver for school decision makers. Together, these financial, health and productivity benefits of ultra-low and ZE school facilities directly align with educational

outcomes and help make the case for energy consideration to be woven into the fabric of current policies, plans and practices in schools.

Market Size and Structure

In 2017, 50.7 million public elementary and secondary students attended K-12 schools in the United States (NCES 2017). The K-12 market consists of 98,200 public school buildings, covering approximately 7.5 billion gross square feet (NCES 2017b). These schools are spread across 13,600 public school districts where elected local school boards represent the public's voice in education and ensure that local tax dollars are spent appropriately (NCES 2017a).

Decisions regarding school facilities are made at the local level and many groups and individuals are involved in the process. All school decision makers are primarily driven by educational outcomes for students. Even though the U.S. Environmental Protection Agency reports that energy is the second highest operating expenditure for schools after personnel costs (estimated at more than $8 billion per year), energy is not a consideration in district decision making (U.S. EPA 2017).

Moving this market to consider energy means influencing different stakeholders. We talked with many of these stakeholders during our California specific research as well as our national focus groups and learned of the different roles each stakeholder takes, from those involved in the big-picture decisions, to those who influence energy use daily and those who influence specific projects. The roles of these influencers fall into three groups described below.

1. Big Picture Decision Makers
    - *School board members* ultimately decide which projects to pursue and whether to put bond measures on the ballot to finance them. School boards solicit input from a variety of stakeholders, including the public, staff and consultants.
    - *School superintendents and business officials* are critical stakeholders in school decision making. These individuals are responsible for the overall functioning of the school district. They report directly to the school board and oversee the development of plans and budgets. They hold a large amount of influence over planning decisions and, according to the interviews, spend little, if any, time considering energy performance in schools.
2. Day-to-Day Energy Influencers
    - The *facilities staff* is responsible for the operation and maintenance of safe, healthy and functioning schools. Generally, they are deployed from the district's central office out to various facilities to address specific maintenance issues, distinguishable from on-site custodians that are responsible for day-to-day cleaning of schools.
    - *Principals, teachers, students and community groups* are the building occupants whose behavior directly results in energy use in schools. Community groups often use or rent the facilities for neighborhood events, also contributing to energy consumption.
    - Some schools have an *energy and/or sustainability manager*. Where these roles exist, energy managers typically work within the facilities group while sustainability managers might work within the facility, administration, or education department.
3. Project Energy Influencers
    - The *construction manager* is responsible for managing capital improvement projects as outlined in a bond measure. Local bond measures are the typical financing approach for local school construction and major renovation projects, as explained in

more detail below. Districts sometimes hire an outside consultant to serve as their authorized representative and manage the construction process.

- *Designers (architects, engineers, contractors, etc.)* work directly for the school district and remain engaged with each school project based on educational and facility related needs. They are responsible for delivering a building in accordance with local codes and educational specifications as defined by the school district.

Funding for School Facilities

Funding approaches for K-12 school facilities generally consist of two categories: (1) general fund dollars for routine maintenance, operations and building upkeep and (2) capital funds for major repairs, renovations and new construction activities. A 21st Century School Fund analysis suggests that general fund expenditures for facilities maintenance and operations come from three primary sources, local (45%), state (45%) and federal (10%) while capital expenditures are 82% local with 18% from the state and 0.2% from the federal government (CFGS 2016, 3).

General fund money is spent to ensure safe and healthy schools, but general fund spending is insufficient. The American Society of Civil Engineers in their 2017 Civil Engineering Infrastructure Report graded schools as only a "D+" for school maintenance and operations and suggest that across the nation that 24% of schools are in "fair or poor" condition with an estimated $38 billion annual maintenance funding gap. (ASCE 2017). Since many schools do not keep up with industry benchmarks in funding levels to maintain and operate school facilities, this contributes to deteriorating facility conditions, shortened facility useful life, and poor student educational outcomes (Vincent and Brown 2015).

Absent a sufficient general fund for maintenance, school districts turn to local bonds to pay for school construction and major renovation projects. However, bonds are also used for safety, demographic/enrollment changes, deferred maintenance issues, the need for technologies to promote 21st century learners, and plans to bring schools up to modern standards (such as the Americans with Disability Act, new codes and standards to address earthquake preparedness, etc.). Prioritizing energy within a bond is often sidelined by these other important considerations.

Capital spending using bonds is typically based on project descriptions outlined in a facilities management plan and included in the bond language. The bond language is very carefully drafted to garner sufficient support at the ballot box, and energy performance is rarely mentioned. A bond oversight committee ensures that funds are used in accordance with the bond language which means that there is little room to add energy requirements if not already in the bond.

In recent years, state and local governments have issued billions of dollars in bond funding to address school facility construction, including new construction and existing school retrofits. For example, in 2016, California has raised $9 billion at the state level (Dillon 2016) and $28 billion in local bond funding (CPUC 2017, 1). In 2017, Oregon has raised $2.2 billion locally (OSBA 2018), and one district in North Carolina raised $2.2 billion for school facilities (Charlotte-Mecklenburg Schools 2017). These projects will be under construction for a number of years. While these projects will proceed with already established goals as their primary objective, they still represent a significant opportunity to encourage ultra-low EUI and ZE outcomes.

Funding for Energy Efficiency in School Facilities

A dedicated source of funding for energy improvement projects is one way to encourage schools to improve energy performance while addressing some of the issues that lead to deferred maintenance. One unique example of success with energy projects in schools is California's Proposition 39. The California (CA) Clean Energy Jobs Act. Prop 39 is a voter approved initiative that changed corporate taxes and transferred up to $500 million per year for five fiscal years from the CA General Fund to the CA Clean Energy Job Fund, beginning in the 2013-2014 fiscal year. According to the Prop 39 guidelines, Prop 39 funds are available to school districts and community colleges for "energy efficiency and clean energy projects, as well as related energy planning, energy training, energy management, and energy projects with related non-energy benefits." Prop 39 funds may be used to hire a resource conservation manager and pay for Power Purchase Agreements if they meet particular requirements (CEC 2013, E-2).

According to the February 2018 CEC Prop 39 snapshot, the funding allocations for the four fiscal years 2013-2017 amounted to over $1.7 billion. The CEC has approved $112 million in planning funds for school districts and $1.14 billion in Energy Expenditure Plan expenditures, which are also supported by other financing methods. This California example, where state funds are dedicated to improving the energy performance of schools, is unique and, according to our in-depth interviews with California stakeholders, has garnered significant interest among school districts to address long overdue maintenance challenges associated with energy. Still, stringent Savings-to-Investment Requirements (SIR) limits investment in HVAC equipment replacement seen as critical to retrofitting schools to SE in California (CPUC 2017, 55 and 67).

School District Policies, Plans and Practices

A variety of policies, plans, practices influence energy performance in school facilities. These include the facility master plan, educational specifications, Owners Project Requirements (OPRs), benchmarking, Strategic Energy Management (SEM) and green building policies. Some of the key ones are summarized below.

- **Facility Master Plan** – The facility master plan is an evolving document that assesses school facilities, establishes an approach on how to accommodate current and future needs, and addresses significant deferred maintenance challenges. Often developed by a Leadership Team consisting of administrators, demographers, architects, engineers and other consultants, the facility master plan serves as a guide for investments and capital improvements across the district's portfolio. Not all districts have a facility master plan, and even those that do often fail to even mention energy performance. The focus tends to be student needs, safety, and educational outcomes.
- **Educational Specifications (Ed Specs)** – Ed specs provide information to architects for the design of school facilities and include space, furnishing, site, program and performance requirements for various school types (primary, middle, secondary) and space types (classroom, labs, common spaces, etc.).
- **Owners Project Requirements (OPRs)** – OPRs are used by school districts to formally outline objectives and expectations for a particular construction project. They describe the project, budget, functional space and use requirements (i.e. building program and occupancy patterns), design process expectations, sustainability goals, building component and equipment specifications and specific performance criteria. A template OPR document can

guide overall district level objectives and can be modified with requirements for a particular project. Including energy targets and the role of renewables is an important part of an OPR on a ZE project.

- **Benchmarking** – Energy benchmarking is "the practice of comparing the measured performance of a device, process, facility, or organization to itself, its peers, or established norms, with the goal of informing and motivating performance improvement" (U.S. DOE 2017). Like the rest of the commercial building market, schools are beginning to benchmark their building performance. Interviewees and focus group participants suggested that benchmarking was another thing on the to-do list, rather than using benchmarking as lens to strategically evaluate activities regarding energy performance. In California, the CEC requires benchmarking as a prerequisite for securing Prop 39 funds.

Barriers and Solutions to Zero Energy in K-12 Schools

The K-12 market faces many barriers that may prevent or delay success in its transition to ZE in both new construction and existing building renovation. Interviews and focus groups conducted as part of this research uncovered three important barriers, including: (1) 1ack of awareness surrounding ZE schools, (2) lack of process to consider energy and (3) lack of financing. Achieving success with ZE will require a coordinated and ongoing effort by many stakeholders and decision makers. The discussion below provides further details regarding the barriers and recommendations on how to overcome them on the path to ZE in schools.

(1) Barrier - Lack of Awareness. Many school decision makers are unaware of the educational and financial benefits of ZE schools. The focus groups revealed that outside of California, some school district representatives thought ZE was only possible in new construction, questioning whether ZE school retrofits were even possible. Since school decision makers, including board members, superintendents and business official have little awareness, there is little demand for ZE, or even using deep energy reductions to absolute energy targets as the first step on the path to zero. Similarly, on the supply side, architects, engineers, contractors and other technical professionals are not prepared or equipped to "sell" or deliver ZE in new and existing schools.

Solution - Information, training and outreach. Professional education can help overcome the lack of awareness barrier. Information, training and outreach regarding ZE should be focused on particular audiences so that it carefully weaves messages regarding the benefits of ZE with the priorities and drivers of the particular decision maker. Here are some specific ways to proactively increase awareness of ZE:

- *Publish case studies*. Efficiency Program Administrators (PAs) can publish case studies explaining the processes and technologies critical in achieving success of ZE in local schools. These case studies can be highlighted in trainings as described further below.
- *Provide decision-maker training*. Educate school "administrative" audiences including school boards, superintendents, administrators, bond oversight committees and capital project managers about ZE and its benefits through in-person workshops and events. Organizations such as the Association of School Board Members or Association of School Business Officials are good places to find these busy professionals. In addition to explaining the values and benefits of ZE schools, these trainings should outline the process that school districts can undertake in order to achieve success. Specifically, this

includes establishing absolute Energy Use Intensity (EUI) targets for facilities and using them in building procurement processes, including Requests for Proposals, OPRs, and contracting mechanisms with design and construction teams and energy service companies.

- *Provide technical training*. "Technical" audiences include architects, engineers, and contractors. These individuals would benefit from additional capability to "sell" and technically deliver ZE schools. These technical trainings should explain whole-building integrated design approaches, how to use EUI targets during the design process, common technical considerations (such as daylighting, natural ventilation, heating and cooling options, photovoltaics, resiliency, passive survivability), and the importance of the hand-off between building design and operations in a successful ZE result.
- *Train building operators*. School districts should include facility staff in early design decisions and train facility managers on systems and equipment that they may be unfamiliar with so that they can operate schools at the EUI target. PAs can leverage programs such as the Building Operator Certification to enhance skills of building operators and ensure persistence of the ultra-low or ZE result.
- *Support workforce education and training*. States, cities, community colleges, universities, and PAs should increase investment in workforce education and training programs to help develop the market capacity to deliver energy efficiency and renewable energy systems by training the next generation of technical professionals.
- *Provide recognition awards*. Recognizing and celebrating ZE with technically defensible ZE awards like the Zero Net Energy Leadership Awards for K-12 Schools and community colleges in California. Expanding this nationally might involve the inclusion of a ZE category in the USGBC Center for Green Schools' Best of Green Schools Awards and/or the U.S. Department of Education Green Ribbon Schools program.
- *Host ZE tours.* Hosting of ZE building tours for school decision-makers. In one district, a school board building tour of a nearby ZE school led to the procurement of five new ZE facilities in the district (G. Sponsellor, Sustainability Analyst, Horry County Schools, Pers. Comm., March 22, 2017)

(2) Barrier - Lack of Processes that Consider Energy. A careful review of the K-12 school decision making process revealed that a number of policy documents help prioritize and implement school facility improvement efforts (the facilities master plan, ed specs, OPRs, etc.). If these plans mention energy goals at all, they are expressed as "percent better than code" in the design process. Rarely are these predicted aspirations in energy models followed up and verified after building occupancy. Few districts have clear energy performance targets for buildings in their existing building portfolio.

Solution – Ensuring Appropriate Processes. Ensuring that the appropriate processes are in place within school district policies, plans and practices will facilitate school districts in efforts on the path to ultra-low EUI targets and eventually ZE. Below are some approaches to help overcome the "lack of processes that consider energy" market barrier:

- *Facilitate benchmarking*. Benchmarking provides important information to school decision-makers regarding the current energy performance of their buildings. Utilities should facilitate the transfer of utility bill data into programs such as Energy Star Portfolio Manager to promote benchmarking. School decision makers can then begin to

use this information to inform their activities. Remote data analytics programs can help school districts pinpoint areas of concern without expensive walk through audits. Additionally, efficiency PAs should consider requiring benchmarking as a pre-requisite for program participation.

- *Identify and mentor energy champions*. One commonality found in ZE projects is the identification of a clear energy champion, someone who is committed to the ZE result and ensures that the team stays on track (CPUC 2017). PAs should identify and mentor this champion through the process, especially during ZE pilots.
- *Set energy targets*. Research, including energy modeling results on new and existing schools and verified performance data, has shown a clear band of energy performance in ZE schools (NBI 2018). This suggests that an appropriate energy target for schools is an energy outcome with an EUI between 19-25 kBtu/square foot-year when measured on a site basis. This variation is due to building type (primary, secondary, portable) and climate zone (Bonnema 2016; CPUC 2017).
- *Use Energy targets in procurement process*. Energy targets are a useful tool for school decision makers to use during the procurement process. School districts (with the help of PAs) should develop objective evaluation criteria regarding ultra-low energy and ZE experience that school districts can use in Requests for Proposals (RFPs) and consider during the team selection process as allowed under public contracting law. These same energy targets can be used in OPRs that document an owner's intent for any new building. In addition to providing template RFP and OPR language, PAs should pilot "performance based procurement" approaches that use energy targets in formal contract and verify building performance once occupied (Pless et al. 2012).
- *Encourage integrated design*. Design and construction teams should use whole building approaches that consider ultra-low energy performance, distributed generation, demand response, resiliency and electric vehicle integration. Public Utility Commissions should recognize that in ZE buildings, cost effective measures like lighting, help to offset less cost effective measures and may warrant a whole building, rather than a measure by measure approach to cost effectiveness. In addition, PAs should incentivize early design meetings, sometimes called eco-charrettes, as well as early energy modeling and cost studies, commissioning and post occupancy verification.
- *Move beyond predicted performance*. Public utility commissions and PAs should consider metered based approaches which rely on actual energy performance rather than predicted savings.
- *Perform thorough building assessments*. According to the experience of ZE retrofits in the California Investor Owned Utility Prop 39 ZE Pilot Program, ZE assessments of existing buildings look beyond lighting and HVAC equipment. They included a careful review of envelope performance and unique design features through observation as well as conversations with maintenance staff and building occupants (CPUC 2017, 56).
- *Include triggers for improvement.* Some districts develop clear "triggers" for efficiency improvements. Examples might be that all new construction projects will achieve EUI of no more than 25 kBtu/square foot-year or all roof replacements might include insulation and sufficient structural to allow for solar installation.
- *Support ongoing operations*. Occupants and operators in ZE buildings must understand their role in the ZE result and be offered information to change their behavior when the building is not achieving the predicted EUI outcomes. PAs should ensure that building

operators are included in early design meetings where sustainable design strategies are vetted and discussed.

- *Verify energy use*. ZE buildings do not stop with predicted energy performance estimates from energy models done late in design. Instead, ZE buildings rely on actual measured energy outcomes in order to ensure that they are operating at ZE. PAs can provide financial incentives for verification.

(3) Barrier - Lack of Funding. School funding is a challenge in many communities. This means that school buildings need so much attention for education, safety, security, and code compliance that it may be difficult to fund energy system upgrades absent funding sources dedicated to energy efficiency. One interview participant in California noted that a $9 billion state-wide bond passed for schools to use to address deferred maintenance was simply a "drop in the bucket" (CPUC 2017, 73) While energy will never be a driver of projects, this significant investment in new and retrofit facilities underway across the country represents an opportunity for these projects to incorporate ultra-low energy targets which capture the financial and educational benefits of ZE.

Solution – Establish Ongoing Funding Mechanism. Even with increased awareness, schools have multiple competing uses for all available funding resources. States and local districts should consider establish ongoing funding mechanism to support continuous improvement toward target EUI goals. Prop 39 serves as an example of a dedicated source of funding from a state to support school energy efficiency upgrades. The California Energy Commission established a process which lays a framework for action. The eight-step process involves:

1) Collecting utility billing data
2) Benchmarking
3) Prioritizing eligible energy projects
4) Project sequencing which prioritizes efficiency over renewables
5) Energy efficiency measure identification through an energy survey, ASHRAE Level 2 audit or data analytics
6) Cost effectiveness that considers non-energy benefits such as enhanced comfort, better indoor air quality, and improved learning environment (capped at 5% of the project installation costs).
7) Energy Expenditure Plan (EEP)
8) Energy project and job creation tracking and reporting

While this is a strong framework for action, even Prop 39 is hindered by cost effectiveness tests that may restrict funding for HVAC equipment. In fact, 64% of the approved measures are for lighting and controls measures while only 24% of measures have been for HVAC and controls. (CEC 2018). This is a challenge, because a recent technical study of school retrofits suggests that HVAC system improvements are consistently the source of the majority of performance improvement in existing building retrofits. Interestingly, in this same technical analysis, envelope performance improvements accounted for only a small percentage of the retrofit energy savings opportunities. (CPUC 2017, 45).

To supplement Prop 39, California IOUs have been directed by the CPUC to conduct a ZE school retrofit pilot. These projects are underway and have provided additional funding to go beyond lighting, to address envelope restoration for daylighting and infiltration and renewable

energy systems. These ZE proof-of-concept retrofits will provide lessons-learned in process and technical retrofit measures that support deep energy reductions.

PAs investment in new construction and existing building retrofit ZE school pilot projects, would help to address the funding gap that currently plagues school funding for capital improvements and demonstrates success with ZE. Retrofit pilots should capture a diversity of school vintages, decision making processes, operational practices and installed measures.

Other financial incentive ideas that States and PAs might consider include:

- Standard offsetting of incremental costs of measures extended to early design charrettes, energy modeling, commissioning, and design team post occupancy.
- Supporting charrettes with stipends to pay for a facilitator and/or team members to participate "bond charrettes" as an opportunity to leverage the flexibility in bonds and seize the opportunity to set aggressive energy targets for all building projects covered under the bond. Instead of happening at the beginning of a particular project, this bond charrette would take place after bond passing and is an opportunity for stakeholders meet early in the process to agree on common energy goals through the bond funding.
- Pay for performance approaches to capture all energy savings – including operational improvements – associated with this school building type. This supports a ZE transition that relies on actual energy performance rather than on predicted energy performance to estimate savings from energy efficiency measure installation.
- Continue a financial stipend for the design team to stay involved post-construction into occupancy of the existing building retrofit to ensure that the ZE energy target is achieved within the first 12-24 months after occupancy. Typically, the design team moves onto the next project after their building is occupied, however a clear link during and after the "hand off" of the building would be valuable to ensure a ZE result.
- Incentivize the cost associated with ZE certification through a program such as the International Living Future Institute's Net Zero Certification (ILFI 2018).

Path to Zero in K-12 Schools

The path to zero energy in K-12 schools will not be easy and should be rooted in continual improvement of energy performance in existing schools. Overcoming the previously mentioned barriers and reaching ZE will require coordinated action by many stakeholders across a diverse, disaggregated and complicated market.

This path to zero will happen at the local level, but can be supported by state agency, utility and efficiency PAs. The approach should include policy and practice that promotes ongoing and continuous energy improvement toward specific and measured energy consumption targets between 19-25 kBtu/square foot-year (rather than the traditional "percent better than code"). This changes the conversation from a predicted to an actual result and encourages designers, contractors, operators and occupants to understand their role in achieving ZE.

Stressing continual improvement of energy performance in existing schools can move schools down the path towards ZE. This requires benchmarking, where districts measure energy performance and learn to analyze this data in order to make more informed decisions regarding operations and retrofits. Districts should integrate energy considerations into their policies, plans and practices. States and PAs can support efforts that encourage ZE new construction and the incorporation of ultra-low energy retrofits into facility planning and implementation activities.

Decisions made now will impact energy performance in 2030 and move the market beyond just 1% of ZE school buildings. It will take efforts across many stakeholders for schools to walk down ZE path, but there are clear actions that organizations can take to lead the way.

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