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Clean and Healthy Schools are Electric

Aligning California's School Infrastructure Investments with our Climate and Health Goals

Years of disruption — by heat waves, wildfires, mudslides and the COVID-19 pandemic — have demonstrated that California's schools are not equipped to keep students safe and healthy.¹ Aging HVAC systems cannot filter wildfire smoke or viruses, so schools close and students fall behind. Students in schools without HVAC systems altogether face even worse outcomes.

The good news is that we have the technology we need to provide healthy learning environments for California's kids. **Upgrading to all-electric HVAC systems with advanced filtration can deliver enormous educational and health benefits to California's students and school staff, all while cutting operating costs.** Electric machines like heat pumps — along with the right policies to lower their upfront cost — are a feasible, efficient, and cost-effective solution to prioritize our students and schools.

The problem: outdated fossil-fuel HVAC systems*...	The solution: efficient electric HVAC systems with advanced filtration...
Are expensive, inefficient, and unreliable	Are cheaper to operate and maintain, saving each school an average of \$110,000 a year
Let pollution — including carbon monoxide, nitrogen dioxide, and particulates — into classrooms	Reduce pollution in classrooms to provide healthy learning environments for students
Can't protect students from wildfire smoke and COVID-19	Keep schools safe and open even when faced with airborne threats, ensuring continued learning
Can't protect students from extreme heat	Keep classrooms cool to provide crucial relief for students and entire communities
Don't provide any resilience benefits	Can be supplemented with on-site renewables and battery storage to serve as fully operational community resiliency centers
Emit greenhouse gasses and undermine California's climate goals	Cut emissions and align with California's climate goals

*Most of these problems are also applicable — and often worse — for schools without HVAC systems altogether.

To fully unlock the benefits of electrification, California must ensure that school construction and modernization dollars in the 2022-23 budget go toward electric heat pumps that efficiently heat and cool school buildings, not new fossil fuel machines. At the same time, the state must dedicate funding to make electric HVAC systems accessible to schools in low-income or disadvantaged communities. And California must also develop a master plan for healthy, equitable, and climate-resilient school buildings to ensure that future funding aligns with the states' climate and health goals.

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The scale of the problem: 10,000 schools full of aging machines

Public schools are central to our communities. However, decades of disinvestment and failure to grapple with the realities of air pollution and extreme weather have rendered California's public schools less safe for our children. That's why, for the first time, U.S. Secretary of Education Miguel Cardona identified climate change as a threat to his department's mission. We must respond by equipping schools with the infrastructure upgrades they need to provide safe, healthy spaces for every child to learn.

California is home to 10,000 schools totalling 730 million square feet of buildings, making our K-12 school system one of the largest public infrastructure systems in the state. The state spends \$15 billion every year on building, renovating, maintaining, and operating its school facilities, which serve 16 percent of California's population each day.² But as air pollution, wildfires, and COVID-19 threaten California's school children, HVAC systems are proving costly to operate and maintain and are unable to ensure student health and safety.

California schools are long overdue for infrastructure investments that reduce costs, ensure healthy learning environments, boost community resiliency, and cut carbon pollution. With billions of dollars of one-time funding for school infrastructure included in the 2022-23 budget, California has an opportunity to make investments that align with its climate and health goals.³ With the rest of the United States watching, California can seize this moment to catalyze school electrification and provide students the healthy, climate-resilient school buildings they deserve.

The scope of the problem: outdated HVAC systems are expensive and unable to protect students

Fossil fuel HVAC systems are expensive, inefficient, and unreliable. The average school wastes \$110,000 per year on energy inefficiencies and maintenance, in large part due to inefficient, outdated systems.⁴ Fossil fuel furnaces, water heaters, and stoves waste energy — burning money that could instead go toward students' education. These outdated machines are also unreliable and need frequent maintenance, disproportionately consuming staff's time and facilities budgets. Across the United States, 36,000 schools need to update or replace HVAC systems.⁵ And when those machines break down, districts sink even more money into repairing them, even though replacing HVAC systems with heat pumps would save money in the long term.⁶

This costly cycle robs students of educational resources. It's also deeply inequitable: decades of disinvestment in low-income communities means that schools with fewer resources can't afford to make vital HVAC upgrades. In California, districts serving low-income families spend a higher-than-average proportion of education funding on building maintenance and repairs, further eroding cash-strapped budgets.⁷ Soaring fossil fuel prices exacerbate these inequities.⁸

What's more, installing new fossil fuel machines in any California school is a poor investment because the state's climate goals will require those machines to be replaced before they are fully depreciated. In other words, schools that install new fossil fuel machines won't get their money's worth on an already expensive, inefficient, and dirty investment.

Fossil fuel machines pollute the air and inhibit learning. Old HVAC systems aren't just costly and unreliable — they're dangerous. Fossil fuel combustion in furnaces, water heaters, and stoves pollutes the air that students breathe every day. Students and staff who spend time in poorly ventilated school spaces are 50-70 percent more likely to suffer respiratory illnesses.⁹ Indoor fossil fuel combustion increases the risk of asthma symptoms by 42



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percent for children living in a home with a gas stove, and the same may be true within school buildings.¹⁰ These illnesses knock students out of school: students — disproportionately students of color — miss 14 million school days per year due to asthma.¹¹

Even when students stay in school, fossil fuel pollutants, including carbon dioxide, nitrogen dioxides, and particulate matter, inhibit learning. Excess carbon dioxide lowers student cognitive function, which in turn lowers memory and concentration levels. Unventilated, polluted classrooms can cut student cognitive function in half.¹²

Failing HVAC systems can't protect students from today's threats of extreme weather, wildfires, and COVID-19. Aging school buildings can't keep students cool in a changing climate — so as the world warms, so do classrooms. Like fossil fuels, extreme heat is both physically dangerous and mentally incapacitating. Student achievement drops one percent with every degree classrooms warm.¹³ And because heat is distributed inequitably and students of color are more likely to attend schools without air conditioning, extreme heat alone is responsible for 5 percent of the gap in standardized test scores between Black and Hispanic students and their White counterparts.¹⁴ In California, this problem is only going to get worse, as the number of dangerous heat days in some parts of the state is expected to increase by up to tenfold.¹⁵ Replacing outdated HVAC systems with heat pumps — or installing heat pumps where no HVAC system currently exists — allows one machine to both heat and cool a building efficiently and makes healthy, learning-conducive classrooms available to more students.

Aging HVAC systems are also failing to keep school air safe and healthy for children. Whether because of COVID-19 or wildfire smoke, many California schools are now regularly closing because of poor air quality. And with each school day lost, students fall behind. In 2018, Marin County, CA lost more than three weeks of school due to wildfires and wildfire smoke, which can be 10 times more toxic than other types of air pollution.¹⁶ More recently, COVID-19 has closed schools and sickened students. **This need not be the case. Although wildfires and COVID-19 may not be preventable, 21st-century HVAC technology with advanced filtration can help keep schools open and students healthy. Costly, polluting, and outdated fossil-fuel HVAC systems just aren't up to these modern challenges.**

The solution: electrification can cut costs and create healthier, more resilient, and greener schools

Electric schools are cheaper to build and maintain. An analysis from the National Renewable Energy Laboratory (NREL) of 88 zero-energy schools confirmed that they cost less to build than conventional schools, in part because they don't require expensive gas hookups. Even in existing schools, heat pumps, heat pump water heaters, and induction stoves have lower lifetime costs than their fossil fuel counterparts because they are so much more efficient.¹⁷ As gas prices rise, electric HVAC systems save schools even more money.¹⁸ Electric schools also require less HVAC maintenance than conventional schools. Across the board, these savings can quickly add up to \$110,000 per school per year.¹⁹

It's critical that electrification — and its health and financial benefits — is accessible to the students and school districts that need it most. Although electric machines save schools money in the long-term, they are sometimes more expensive than fossil fuel systems up front, especially in the case of renovating existing buildings. That's why increased targeted funding for the California Schools Healthy Air, Plumbing, and Efficiency Program (CalSHAPE) is so important: it will level the playing field, enabling school electrification by subsidizing the up-front costs of electric HVAC systems.



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Electric HVAC systems don't pollute the air inside schools, and can ensure safe learning environments in the face of extreme weather, wildfires, and COVID-19. Electric machines don't pollute the air. That means no more carbon dioxide and monoxide, nitrogen dioxide, and particulates from on-site fossil fuel combustion. In turn, evidence from homes²⁰ suggests that electric machines in schools will reduce the burden of asthma and other respiratory illnesses for students and staff. Electric HVAC systems with advanced filtration can increase students' strategic thinking and information processing by 300 percent, according to a study from the Harvard T.H. Chan School of Public Health.²¹

New, electric HVAC systems can leverage advanced air filtration technology to protect students from COVID-19, wildfire smoke, and other external pollutants. Elementary schools in Georgia that improved ventilation and used high-efficiency filters in classrooms reduced COVID transmission by 48 percent, according to a CDC study.²² High-efficiency filters, when paired with electric HVAC systems, can keep students in school during wildfire season, too.

Electric schools can serve as resiliency centers, providing crucial educational and community services when they're needed most. Because electric schools use efficient heat pumps to both heat and cool classrooms, they don't have to close on extremely hot days. In fact, electric schools can stay open all summer to provide critical cooling services to students and community members. Electric schools are also disaster resilient: when supplemented with on-site renewables and battery storage, electric schools can serve as fully operational resiliency centers even when the power goes out. In California, electric machines reduce the risk of gas leaks²³ and explosions,²⁴ especially during earthquakes.

Last but not least, electric schools cut emissions and therefore reduce the risk of extreme weather and other dangerous climate impacts. The operation of California's school buildings produces over 1.6 million tons of emissions per year, exacerbating extreme weather events.²⁵ They're also incompatible with at least four of California's climate goals: retrofitting 50 percent of commercial buildings (including schools) to zero net energy by 2030,²⁶ achieving carbon neutrality by 2045,²⁷ enacting the Climate Adaptation Strategy,²⁸ and enacting the Extreme Heat Action Plan.²⁹ Given that some HVAC systems have lifespans of 20-30 years, California is already overdue in ensuring that school investments work towards, and not against, the state's 2045 carbon neutrality goal. **Without a commitment to electrification, California schools could spend billions of dollars on fossil-fuel machines that may have to be replaced in just a few years.**

Next steps: California must commit to electrification now

California has all the technology and resources needed to provide every student with a safe and healthy learning environment—and to cut costs along the way. To make electrification the standard now and in the future, California's leaders must:

1. Ensure that one-time General Fund dollars for school modernization and new construction in the 2022-23 budget are spent in alignment with California's climate and health goals. This can be accomplished with small language modifications to the education omnibus budget trailer bill.
2. Include an additional \$475 million in the 2022-23 budget for the California Schools Healthy Air, Plumbing, and Efficiency Program (CalSHAPE) to fund electric HVAC systems in low-income communities, via budget bill language, drawing from the \$3 billion of set-aside climate dollars.
3. Include \$25 million in the 2022-23 budget for the development of a statewide Master Plan for Climate Resilient Schools, and for technical assistance to districts and schools, via budget bill language, drawing from the \$3 billion of set-aside climate dollars.



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With billions of dollars of one-time 2022-23 funding proposed for school infrastructure, it is imperative that leaders include clear standards for emissions reductions and climate-resiliency. California cannot afford to invest in new construction or major renovations that continue to rely on fossil fuels and create stranded assets down the line. School infrastructure funding must be brought into alignment with California's climate and emissions reduction goals.

Increased funding for CalSHAPE will enable school electrification by reducing the up-front costs of electric HVAC systems. By leveling the playing field, CalSHAPE will ensure that electrification — and the subsequent increase in air quality and decrease in operating costs — will be accessible to the students and school districts that need it most.

Extraordinary times also call for extraordinary vision. The development of a statewide Master Plan for Climate Resilient Schools — along with technical assistance to districts and schools — will ensure that future school infrastructure investment is cost-effective and aligned with California's climate commitments, Climate Adaptation Strategy, and Extreme Heat Action Plan. A master plan will also coordinate state, county, and district action to safeguard children's health, inspire growth and learning, and secure a climate-resilient future for all Californians.

The health and climate stakes for our schools couldn't be higher. But with a historically large budget and federal infrastructure investments to back it up, California's leaders have a once-in-a-generation opportunity to prioritize our students and schools. With the right policies in place to make electric HVAC systems the new standard in schools, California can once again lead the nation toward a safer, healthier, and more resilient future.

Rewiring America is a nonprofit organization focused on electrifying everything. Rewiring America's vision of market transformation will help American families save money on their energy bills, improve the air quality in their day-to-day lives, and create family-sustaining jobs that cannot be automated or offshored in every community in America. It is the optimistic path to addressing the climate crisis — one that will rebuild and reinvigorate our communities along the way. Learn more at rewiringamerica.org.

UndauntedK12 is a nonprofit organization working to support America's K-12 public schools to make an equitable transition to zero carbon emissions while preparing our youth to shape and build a sustainable future in a rapidly changing climate. We believe the current moment offers an opportunity for action to address inequities, stimulate the economy, enhance critical public infrastructure, and position America to lead the world in the transition to clean energy-driven commerce and community. Learn more at undauntedk12.org.

The UC Santa Barbara 2035 Initiative develops political and policy roadmaps to help stabilize climate change by 2035. We know that confronting the climate challenge at scale is not just about technological and economic know-how. We also need political solutions for our climate and energy problems. We use cutting-edge empirical research, policy development and media engagement to support transformational policy change in the United States and across the planet. The 2035 Initiative is a collaboration between world-leading environmental policy and politics research labs at the University of California Santa Barbara.

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