Electrification Can Make Hot, Stuffy Classrooms a Thing of the Past

Electrification of HVAC systems in schools could improve student health and learning outcomes while fighting climate change.

by Elizabeth Waters

Schools across the country are aging and suffering from underinvestment—and so are their HVAC systems.

Outdated and inadequate HVAC systems negatively affect indoor environmental quality (IEQ), contribute to community pollution, and leave schools even more vulnerable to the effects (and costs) of climate change and disease, according to the Rocky Mountain Institute (RMI) and UndauntedK12. A 2023 report from the two organizations, *HVAC Choices for Student Health and Learning: What Policymakers, School Leaders, and Advocates Need to Know,* recommends that schools be built and retrofitted with all-electric, high-performance HVAC systems, primarily heat pumps, to promote student health and climate resilience while reducing utility costs and pollution.

The report draws from research connecting poor IEQ to occupant discomfort, reduced cognitive function, respiratory illnesses, and disease spread. It explains that, in schools, low IEQ can lead to absenteeism, poor academic performance, and lost learning time. These effects are most acute for students in schools that receive less investment, often those in low-income or rural areas and communities of color. According to an analysis of nationally representative survey data, RMI and UndauntedK12 estimate that HVAC systems are responsible for an average of 56% of school energy use, with almost two-thirds of that derived from onsite burning of fossil fuels. And nearly 40% of schools have only partial cooling capacity, leaving them vulnerable to rising temperatures due to climate change. The report also notes that older HVAC systems are often ill-equipped to provide adequate and cost-effective ventilation and are incompatible with the most effective air filters, making it more difficult to rid buildings of viruses and other contaminants.

The report argues that transitioning to all-electric, high-performance HVAC equipment is possible and necessary, breaking the task down into "six big ideas."

- HVAC functions are responsible for the most significant portion of school utility costs, energy use, and emissions.
- While traditional HVAC systems burn fossil fuels to make heat, modern systems move heat to make heat and are effective even in cold climates.
- High-performance air filters best enable schools to remove contaminants.
- Cost-effective ventilation is achievable for schools in all climates.
- HVAC systems should be designed for the specific context of each school.
- HVAC systems must be maintained and optimized over time.

While there is no blanket HVAC solution for all schools, the report lists six bene-

fits of upgrading to modern technology. Modern, all-electric systems can:

- meet increasing cooling and ventilation needs;
- eliminate pollution and improve indoor environmental quality;
- improve energy efficiency; increase resilience;
- minimize the risks associated with onsite combustion, such as carbon monoxide; and
- reduce contributions to climate change.

It's important to consider that all-electric HVAC systems can also contribute to climate change. In its FAQ section, the report explains how refrigerants used in cooling systems have varying degrees of global warming potential (GWP). For this reason, it's necessary to follow best practices when working with refrigerants, such as designing HVAC systems to minimize the amount of refrigerant needed, choosing refrigerants with low GWP, maintaining systems to prevent leaks, and properly disposing of refrigerants during decommissioning—especially when replacing older systems.

Widespread investment in modern equipment will require maximizing the unprecedented federal funding currently available for energy improvement in schools, advance planning, and a shift from short- to long-term thinking, the authors argue. Today's HVAC decisions will have far-reaching and decades-long consequences. In addition, they say, by choosing electrification and focusing on in-need schools, we can improve the lifelong health and educational outcomes of millions of children, advance our country's 2050 net-zero-emissions goal, and better position ourselves to weather the challenge of climate change.

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