School Decarbonization Strategy Spotlight: Kitchen Electrification

Kitchens are a critical component of schools, especially for schools and districts with a high percentage of students receiving meals through the National School Lunch Program (NSLP); in the 2022 fiscal year, the NSLP provided 4.8 billion low-cost or free lunches.[1] This resource guide provides information about all-electric kitchens and how to incorporate them into a school or district decarbonization roadmap.

Efficient, electric school kitchens provide a variety of benefits:[2]

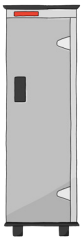
Comfortable Conditions	✓ Induction cooktops minimize waste heat, keeping the kitchen cooler and more enjoyable to use, and are easier to clean. Using less chemicals to clean, water, and labor hours saves costs over traditional fossil fueled kitchens. ✓ In smaller-scale kitchens, decreased ventilation requirements can reduce overall kitchen noise.
Health and Safety	✓ Greatly reduced risk of kitchen fires. ✓ For induction cooktops, only the surface under the pot becomes hot, reducing burns and injuries and keeping the kitchen cooler. Safety features such as cooking timers, alarms, and automatic shut off if a pot boils over or boils dry.
Indoor Air Quality Improvement	✓ No harmful pollutants are released during cooking, reducing the risk of acute and chronic health effects for staff as well as students who eat near the kitchen. ✓ Eliminates gas leaks, which occur even when equipment is off.
Culinary Performance	✓ Induction cooking increases productivity and allows for a faster throughput. ✓ Lengthens life of equipment such as pots and pans. ✓ Precision temperature control that quickly reacts to user adjustments and remains consistent throughout use.
Energy and GHG Savings	✓ Lower heat gain = reduced air conditioning use in hot climates. ✓ Reduces the demand on ventilation hoods. ✓ Electric options offer efficiency gains. ✓ Reduction in greenhouse gas emissions.

Key Components of an Electrified Kitchen

Every piece of commercial gas-fired food preparation equipment has a modern, electric counterpart designed to be more efficient, safer to use, and capable of outperforming its gas version. These pieces of electric equipment have the added benefit of providing more control over cooking and operation, increasing overall throughput, and decreasing overhead costs in the process. There are some technologies that are more applicable to schools, including:

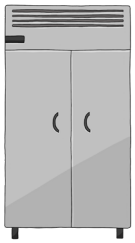
Induction Ranges

Induction cooking is typically 80-95% efficient, as compared to gas ranges which are closer to 30%.[3]



Warming Cabinets

Insulated ENERGY STAR-certified hot food holding cabinets are about 70% more energy efficient than standard models.[4]



Refrigerators and Freezers

ENERGY STAR-certified commercial refrigerators and freezers decrease energy use by 20% compared to standard models.[5] Look for models that use low global warming potential (GWP) refrigerants like R290.

Water Heaters

Heat pump water heaters are 2-3 times more efficient than standard gas or electric tank models.[6]

Artwork by Nicole Kelner

Additional electric equipment options that may be appliable in certain kitchens:

- Fryer
- Steamer
- Wok
- Convection oven
- Combination oven
- Buffet case

ENERGY STAR®[5] and Redwood Energy[7,8] provide more specific details about electric kitchen equipment options as well as compare costs and other key equipment metrics.

Ventilation System Maintenance and Upgrades

A proper ventilation system is critical for removing air pollutants from the kitchen and maintaining air quality. The overall ventilation needs of a kitchen will be decreased as gas kitchen equipment is replaced with electric options. In the meantime, schools should incorporate the following activities to optimize their current ventilation system and plan for a new system:

- ✓ Complete regular maintenance of duct work and baffles.
- ✓ Eliminate any air currents or drafts being pushed into the kitchen. High-powered fans or open doors can throw off the air balance in the kitchen and cause the hood system to not work as intended.
- ✓ When installing a new system, opt for a demand control ventilation system. This will ensure the system can dynamically react to the level of use and will maximize energy savings.

Roadmap to a Decarbonized Kitchen

Make a Plan: Incorporate kitchen upgrades into your strategic planning process; emergency replacements make choosing an electric alternative more challenging. Upgrading from gas to electric appliances increases the total amount of electricity going through the electric panel, which may exceed the panel capacity. Upgrades to the panel itself and additional wiring and outlets for the new electric equipment may be necessary. Plan for a qualified contractor or electrician to evaluate these needs.

Develop Stakeholder Messaging: Identify who has a stake in the success of kitchen decarbonization and start a dialogue early. Anticipate real or perceived challenges; for example, convincing staff to adopt new cooking equipment may be challenging. Understand the benefits of the upgrades and be able to communicate them. Create a training plan to communicate how easy the new equipment will be to use and plan to provide demonstrations.

Build the Financial Case: Electric equipment can be more expensive upfront than gas equivalents. However, electric equipment is typically more cost-effective over the full useful life. This can be due to factors like reduction in pot and pan replacements, elimination of cooking oil costs, decreased ventilation requirements, and less HVAC use.

To see the energy and cost savings for various pieces of kitchen equipment, use the calculators offered by California Energy Wise.

Somerset-Berkley Regional High School | Somerset, MA
Credit: Ai3 Architects

Central District Kitchens vs. Distributed Kitchens

As schools develop the strategic plans for their kitchen(s), there are unique considerations for central district kitchens vs. distributed kitchens in schools:

Scale and Efficiency: Central kitchens can benefit from economies of scale, meaning they might achieve energy efficiencies more readily than smaller kitchens. Upgrading one central kitchen to energy-efficient equipment or sustainable practices can be more cost-effective than upgrading many smaller kitchens, which require an individual assessment of needs and potential upgrades.

Transportation: If meals are prepared in one central location, they need to be transported to individual schools. This can add to the carbon footprint, especially if vehicles are not energy efficient.

Infrastructure Upgrades: Upgrading or retrofitting one large kitchen might be logistically simpler than addressing many smaller kitchens' different infrastructure needs, which can complicate upgrades. There's also the potential for bulk purchase discounts.

Operational Training: Training may be more decentralized and varied in distributed kitchens. Training inconsistencies can lead to frustrations with unfamiliar equipment.

Resilience: If a central kitchen faces issues (e.g., power outages, contamination), it can affect all the schools it serves.

As shown, each approach comes with tradeoffs related to carbon reductions. When making decarbonization plans, consider the amount of carbon reduced, cost, space implications, and impacts to students for each approach.

Kitchen Electrification in Schools: Cobb County Case Study

In this district, electric ovens passed the test for students and kitchen staff while eliminating the downsides of gas fryers.

School/District Name: Cobb County Schools in Atlanta, GA

Number of Students: 107,400

Project Summary: The Cobb Schools Food and Nutrition Services team serves more than 63,000 lunches every school day. To develop healthier menus and reduce excess heat and ventilation associated with gas fryers, the school district worked with the Georgia Power Customer Resource Center to explore electric equipment options. An important component of this process was a student taste test; students gave their stamp of approval to a bakeable french fry that retained its crispiness. As a result, three electric convection ovens ("re-thermalizers") were purchased for each of the county's 16 high schools. These electric ovens provided adequate capacity for the hectic two-hour lunch window and were found to be more time efficient than conventional gas convection ovens, yield energy savings, and provide cooler conditions for kitchen staff.[9]

Cost Information: Many facilities upgrades in the Cobb County School District, such as kitchen improvements, are made possible through an "Education Special Purpose Local Option Sales Tax Resolution," a voter-approved one-cent tax on all consumer goods.[10] This means there is no interest to pay back and has allowed Cobb County schools to eliminate their long-term debt. The school district also received utility rebates that brought down the equipment purchase price. Eliminating the 2,450 pounds of cooking oil used by each fryer annually resulted in estimated direct savings of $1,400 per fryer replaced.

To Learn More About Electrified School Kitchens:

In addition to the resources provided throughout this document, the following resources offer additional insights into electrified school kitchens.

- NBI's All-Electric Commercial Kitchens webinar explores how and why to electrify a commercial kitchen of any size.
- ENERGY STAR's Energy Savings Tips for Small Businesses: Restaurants outlines targeted energy use reduction strategies for commercial kitchens.
- Frontier Energy's Commercial Food Service site offers case studies, a wide range of resources, seminars, and incentive program information.
- California Energy Wise Design Guides offer detailed guidance on achieving optimum performance and energy efficiency in commercial kitchen equipment.

References

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2 William J. Worthen Foundation, "The Building Decarbonization Practice Guide: A Zero Carbon Future for the Built Environment," 2023. https://worthenfoundation.org/get-the-guide-bdpg

3 The Building Electrification Technology Roadmap (BETR): A BETR Path to Decarbonization for California Efficiency Programs. https://newbuildings.org/resource/the-building-electrification-technology-roadmap/

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6 U.S. Department of Energy, "Heat Pump Water Heaters." https://www.energy.gov/energysaver/heat-pump-water-heaters#:~:text=Heat%20pump%20water%20heaters%20use,like%20a%20refrigerator%20in%20reverse

7 Redwood Energy, "Zero Carbon Commercial Construction: An Electrification Guide for Large Commercial Buildings and Campuses, 2nd Edition," 2019. https://www.redwoodenergy.net/research/zero-carbon-commercial-construction-2nd-edition

8 Redwood Energy, "A Pocket Guide to All-Electric Commercial Retrofits," June 2022. https://www.redwoodenergy.net/research/redwood-energys-pocket-guide-to-all-electric-commercial-retrofits

9 Electric Foodservice Council, "Electric Commercial Ovens: Would You Like Fries With That?," 2019. https://www.efcouncil.com/case-study/cobb-county-school-district/

10 Cobb Schools, "Ed-Splost V," https://www.cobbk12.org/page/9855/ed-splost-v

The Decarbonization Roadmap Guide for School Building Decision Makers identifies cost effective strategies and approaches to help school districts achieve healthy, efficient, and decarbonized school facilities. This content was developed in partnership with Forward Dining Solutions, EcoChef, and WRNS Studio. Special thanks to Chef Chris Galarza for his time and expertise.

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