



The Future of School Kitchens Vacaville, CA

California schools have recently received state funding to upgrade their kitchen equipment and increase freshly prepared meals for their students. With this initiative, schools must look toward faster, smaller, and more flexible pieces of kitchen equipment to optimize their spaces, mitigate labor limitations, and reduce their carbon emissions. But what would a true K-12 kitchen of the future look like?

Frontier Energy’s Food Service Technology Center (FSTC), in support of PG&E’s commercial foodservice customers, assessed the energy consumption of the cooklines at two public high schools in the Vacaville Unified School District. The two sites had similar menus and throughputs but utilized substantially different cooking equipment representing distinct equipment “eras”. Vacaville High School’s cookline is characterized by traditional, non-programmable, natural gas-powered technologies common to its early 2000s vintage. Here, convection ovens, griddles, and open burner range tops were standard specifications. Recently remodeled, Will C. Wood High School’s cookline represents a forward-thinking “kitchen

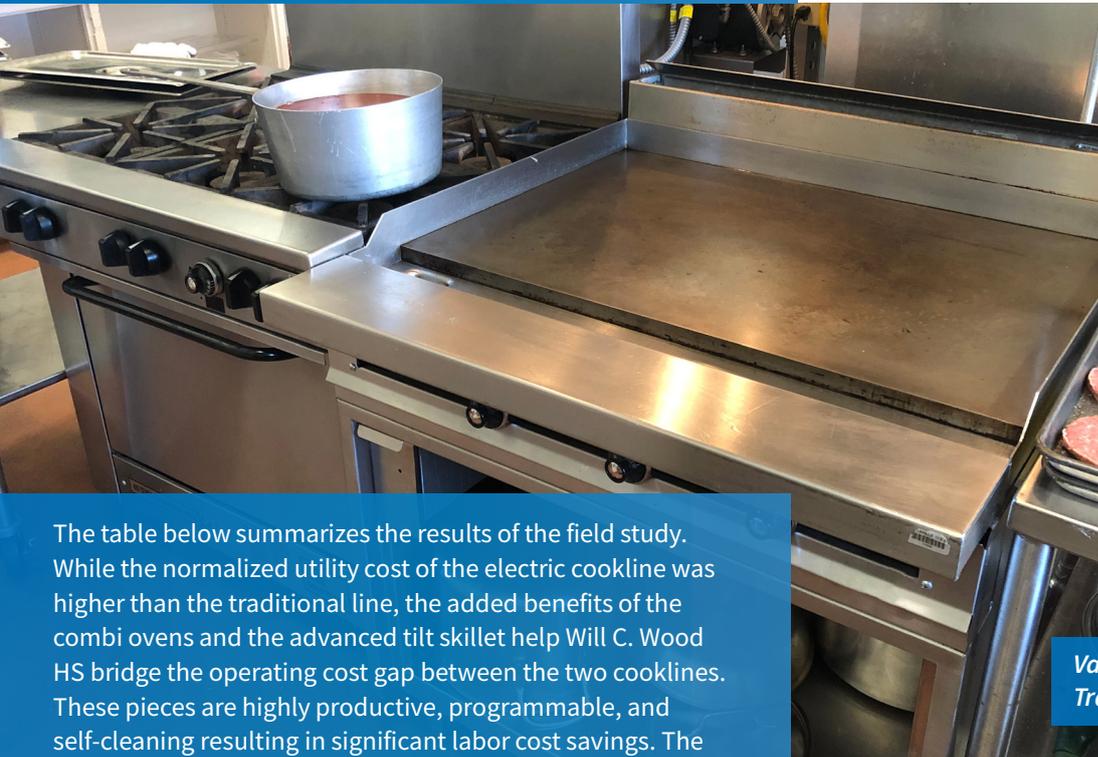
*Will C. Wood High School:
Advanced, Electric “Kitchen of the Future”*

of the future” design with multifunctional, labor-saving equipment with smart controls like combination ovens and tilt skillets. Additionally, the primary Will C. Wood equipment pieces are electric, which is a major departure from the kitchen design practices of yesterday. The table below lists the equipment, footprint, and meals per day of each school kitchen.

Frontier Energy individually sub-metered the equipment in the two kitchens for their energy consumption and operating patterns. The in-situ energy use was compared based on the number of meals served at each site and the kitchen footprint. Annual utility cost was estimated based on the metered data and average energy rates. Finally, the annual carbon footprint from each cookline was estimated and compared.

School Kitchen Cookline Equipment: Vacaville HS vs. Will C. Wood High School

Location	Vacaville High School Traditional Natural Gas Cookline	Will C. Wood High School Advanced, Electric “Kitchen of the Future” Cookline
Cookline Equipment	<ul style="list-style-type: none"> • Double-stacked Convection Oven • Single Convection Oven • 6-Burner Range with Oven • 3-foot Griddle 	<ul style="list-style-type: none"> • (2) Electric Combi Oven • Traditional Natural Gas 4-burner Range • Advanced Design Electric Tilt Skillet
Cookline Footprint (ft ²)	64	40
Average Number of Meals Served per Day	750	600



*Vacaville High School:
Traditional Natural Gas Cookline.*

The table below summarizes the results of the field study. While the normalized utility cost of the electric cookline was higher than the traditional line, the added benefits of the combi ovens and the advanced tilt skillet help Will C. Wood HS bridge the operating cost gap between the two cooklines. These pieces are highly productive, programmable, and self-cleaning resulting in significant labor cost savings. The “kitchen of the future” cookline at Will C. Wood used less than half the energy per 100 meals served than Vacaville HS’s legacy natural gas cookline. Considering the measured daily energy use per square foot of cookline, Vacaville High School again used nearly double the energy of Will C. Wood. This difference is attributable to the higher energy efficiencies in electric cooking equipment versus natural gas, which is 2 to 3 times more energy intensive on average.

With the best-in-class energy-efficient combi ovens being the main drivers of energy use, the resulting carbon footprint of the Will C. Wood cookline is also substantially lower than the all-natural gas-powered cookline at Vacaville HS.

PG&E’s low 2021 electricity generation carbon intensity benchmark and future aim of achieving a net zero energy system by 2040 puts school districts like Vacaville well on their way to meeting California’s goal of decarbonizing K-12 facilities by 2045. Vacaville USD continues its commitment to decarbonization with the pending 2024 construction of an all-electric central kitchen that will build upon the positive experiences with Will C. Wood HS’s advanced kitchen equipment. Here, the specification of combi ovens and advanced tilt skillets as well as induction cooktops, rapid cook ovens, and cook/chill systems will see the district become operators of a true “kitchen of the future”.

School Kitchen Cookline Energy Comparison: Vacaville High School vs. Will C. Wood High School

Location	Vacaville High School Traditional Natural Gas Cookline	Will C. Wood High School Advanced, Electric “Kitchen of the Future” Cookline
Cookline Footprint (ft ²)	64	40
Daily Gas Usage (therms)	12.4	1.0
Annual Gas Usage (therms)*	2,232	180
Daily Electricity Use (kWh)	7.4	104
Annual Electricity Use (kWh)*	1,332	18,720
Energy Use per Sq. Foot of Cookline (kBtu)	19.8	11.4
Normalized Energy Use (kBtu/100 meals served)	169	76
Total Daily Utility Cost (\$) **	\$26	\$32
Annual Utility Cost (\$) **	\$4,740	\$5,780
Normalized Utility Cost (\$/100 meals served) **	\$3.50	\$5.35
Annual Cookline Carbon Emissions (MTCO₂e) ***	12.0	1.8

*Assumes 180 school days per year.

**Assumes a PG&E B-19 electric rate of \$0.29/kWh and PG&E 2023 forecast average G-NR1 natural gas rate of \$1.95/therm.

***Carbon emissions based on PG&E’s 2021 benchmarking of greenhouse gas emissions for delivered electricity reporting of 0.098 lb/CO₂/kWh.