

Plug Load Replacement Study

Mills College
Founders Commons Dining Hall
Oakland, CA

Textbook Energy Savings...

Mills College is a private liberal arts college located in Oakland, California. Named one of the greenest colleges in the nation by the Princeton Review, Mills has a dedicated sustainability program leading several green initiatives on campus like solar power implementation and food justice. Mills College also consistently ranks as one of the best colleges for food in the U.S. Its central Founders Commons Dining Hall caters to all diet types from omnivore to vegan with delicious ingredients sourced from local farms including their own Mills Community Farm. Founders Commons serves all-you-can-eat buffet-style meals seven days a week to Mills College's approximately 1,300 students.

With their numerous sustainability bonafides, Mills College was a perfect partner site for the *Electric Plug Load Savings Potential of Commercial Foodservice Equipment* project. Frontier Energy worked in conjunction with Pacific Gas & Electric Company (PG&E) to conduct this study as part of the California Energy Commission's Public Interest Energy Research (PIER) program through the Electric Program Investment Charge (EPIC) program.



Baseline Conveyor Toaster (left) and Replacement Conveyor Toaster (right) with Advanced Controls



Frontier Energy researchers characterized the energy use for a large variety of plug load equipment (i.e. appliances using a common 120V plug) at the Founders Commons Dining Hall. After analyzing the energy profiles of their existing plug loads, researchers targeted appliances with the highest potential for energy savings through replacement with the most advanced, energy-efficient alternatives currently available in the marketplace.

BEFORE:

- An 11-quart wet-well soup warmer consuming 1.5 kWh per day.
- A standard conveyor toaster consuming 10.7 kWh per day.
- The two standard plug load appliances accounted for 12.2 kWh per day, or 3,904 kWh per year.

AFTER:

- The wet-well soup warmer was replaced by an induction dry-well of equivalent capacity consuming 0.54 kWh per day.
- The standard conveyor toaster was replaced by an energy-efficient model featuring an automatic energy-saving mode and touchscreen control interface with programmable recipes.
- The replacement plug loads consume about 8.41 kWh per day, or 2,691 kWh per year.

The two plug load replacements combined to save Mills College 31% in daily energy use, or about \$182 annually.

Annual Operating Costs¹

Pre-Makeover Costs **\$586**

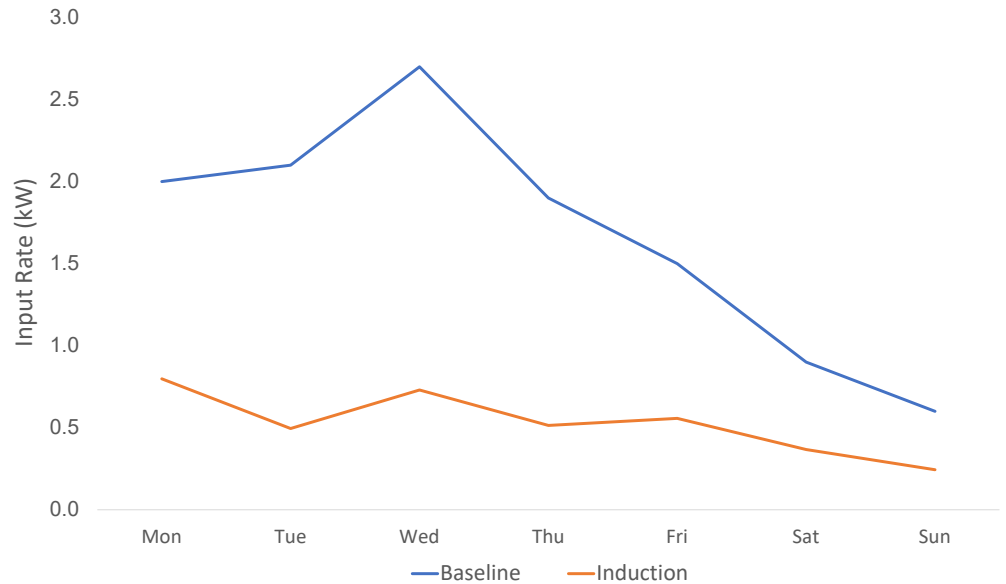
Post-Makeover Costs **\$404**

¹Based on \$0.15/kWh and 320 days of operation per year.

Typical Daily Energy Use, Baseline Wet-Well vs. Induction



Replacement Induction Dry-Well Soup Warmer (left) and Baseline Wet-Well Soup Warmer (right)



A commonplace plug load in cafeterias and cafés, most soup warmers in use today are wet-wells using manually-filled water in a heated well to maintain soup temperatures throughout a service day. These warmers require staff to occasionally refill the wells to maintain water levels. Wet-wells typically exhibit uneven heating resulting in soup “crusting” onto the walls of the well, reducing soup yield and requiring more rigorous clean-up. After replacing Founders Commons’ wet-well warmer with an induction dry-well, not only did the dining hall see a 64% reduction in energy use, but also improved temperature uniformity and accuracy, reduced maintenance (no water level refills), and easier clean-up. Frontier Energy researchers observed similar benefits from an induction replacement at a café site in this study, further strengthening the case for induction soup warmer adoption.

Founders Commons also features a self-service toaster station where students can toast baked goods to their own preference levels. The standard conveyor toaster had simple on/off controls that would run at full power all service day regardless of use. The replacement energy-efficient conveyor toaster automatically turns to a lower energy standby mode after 30 minutes of inactivity, minimizing the energy use when it’s not needed. When a new food product is loaded, however, the toaster immediately ramps back to full power and adjusts the conveyor belt speed as needed to provide the same toast quality. The standby mode demonstrated energy savings without compromising product quality or impacting service times. Mills realized about a 26% energy savings with the replacement toaster. The smart controls also give students the ability to more precisely and repeatably achieve their desired toast level.

Though a small load in a large dining hall, the energy-efficient plug load replacements demonstrated real functional and energy cost advantages over their standard counterparts. With most large cafeterias and commissaries operating up to 10 plug load appliances at any given time, the aggregate energy savings associated with advanced, efficient technologies could be even greater.

