



Cooking Equipment and Kitchen Ventilation System Baseline & Replacement Characterization Study - Final Fact Sheet

Frontier Energy, Inc. is a dedicated team of engineers, technicians, culinary experts, educators, and energy specialists who use their expertise to encourage the commercial foodservice industry to become more sustainable in their purchasing decisions and operations.

Comprehensive Commercial Kitchen Equipment Retrofit Project

Frontier Energy collaborated with the California utilities to replace five commercial cooklines with high-efficiency cooking equipment. The five sites included Moffitt Café at the University of California-San Francisco (UCSF) Medical Center and Pleasanton DoubleTree by Hilton in PG&E service territory; Gate Gourmet and Versailles Cuban in SoCalGas service territory; and Werewolf Bar & Grill in San Diego Gas & Electric service territory.

Energy-Efficient Equipment Selection

Frontier Energy teamed up with leading innovative commercial cooking equipment manufacturers to replace existing baseline equipment with energy-efficient alternatives. Researchers tested all equipment for the project at the Food Service Technology Center and selected replacement candidates based on potential energy savings demonstrated during testing. Innovative technologies included efficient burner and flue designs, improved insulation, and intelligent controls. Manufacturers donated most of the equipment to the project.

Cookline Analysis

Frontier Energy submetered existing cooking equipment and ventilation systems to determine the most energy intensive appliances. Underfired broilers, steamers, ovens and fryers represented the greatest energy use across the five sites. Underfired broilers, present in three of the five sites, consumed the most energy due to high cooking temperatures and non-thermostatic controls. Steamers at two of the monitored sites proved to be huge energy and water guzzlers. Ovens and fryers present at all sites displayed lower energy consumption per appliance, but added up to a significant portion of the restaurant's total energy consumption. Most typical cooklines, consisting of 10 to 15 appliances, consumed on average 18,500 therms per year.

The Retrofit - Upgrading the Cookline

After establishing the most energy intensive equipment on the five cooklines and selecting energy-efficient alternatives, baseline equipment was replaced and metered for energy consumption. Most gas equipment was easy to replace, while other equipment required an additional electrical connection to power controls and burner fans. Steamer and combi oven replacements required upgrading the water filtration system at one site.

Restaurant owners were happy with the equipment replacement; however, some equipment like combi ovens and fryers with oil filtration had a learning curve, which necessitated multiple training sessions.

Capturing the Energy Savings

Researchers submetered replacement energy-efficient equipment for gas and water consumption over several months to capture energy savings over baseline equipment. Replacement equipment included fryers, griddles, broilers, ovens, steamers, and rangetop cookware. Baseline energy usage of each appliance ranged from 3 therms/day for fryers to 10 therms/ day for broilers with all monitored appliances operating an average of 16 hours/day. Ovens and broilers operated the longest at 18 hours/day and rangetops had the shortest average operating time of 11 hours/day. Ventilation hoods operated between 16 hours and 21 hours per day depending on the service hours.

Energy Savings Results

Energy savings varied between 20% and 60% for each appliance replaced.

The average cookline gas consumption was reduced by 6,500 therms per year (a 35% reduction) by strategically replacing existing equipment with energy-efficient alternatives.

Project Benefits

Each site experienced thousands of dollars in energy and water savings from energy-efficient appliance replacement and ventilation system optimization. Beyond the monetary savings, efficient appliances had advanced controls allowing fryer operators to see their oil temperatures in real time and set cooking timers. Manual griddles upgraded to thermostatic units maintained more consistent temperature control, improving product quality. Energy-efficient ovens resulted in more uniform cooking and replacement combi ovens allowed restaurants to expand their menu through multi-stage cooking of more complex dishes. Energy-efficient appliances also reduced the heat load in the kitchen making the work space more comfortable for staff. Demand control ventilation reduced heating and cooling costs while significantly reducing the fan noise level in the kitchen.

Education

Project findings were shared with a technical advisory committee consisting of California utilities and influential foodservice operators and industry professionals. Participating manufacturers will be able to use project findings to promote sales of energy-efficient equipment and other manufacturers will understand the value of developing more energy-efficient products. Information such as the successes and lessons learned from this project will be disseminated through seminars, webinars, and industry articles. Data collected from the demonstration sites will be used to support existing utilities' energy-efficiency programs and widen emerging technology programs.

These programs ultimately drive energy savings and emission reduction in California.

Benefits for California

With an estimated 93,300 CFS facilities operating in California, the total gas load of these establishments approaches 40% of the overall commercial gas consumption in the state (Zabrowski, 2010). Across all California's foodservice establishments, there are roughly 560,000 major commercial gas-fired cooking appliances, accounting for 475 million therms consumed annually (Zabrowski, 2010).

With annual cookline energy consumption ranging between 8,000 and 42,000 therms per year, this study demonstrated that it is possible to reduce the entire cookline gas energy usage by 35% with strategic appliance replacement.

Full Report:

For more detailed project information, case studies, and the full report, please visit: <https://fishnick.com/ceccook/>

This fact sheet summarizes the *Cooking Equipment and Kitchen Ventilation System Baseline & Replacement Characterization Study* conducted by Frontier Energy on behalf of the California Energy Commission's (CEC) Natural Gas Research and Development Program. Contract Number PIR 14-008