

## Program Design Guidance

### Steamers

Steamers are one of the most significant energy saving opportunities in commercial kitchens. Steamers work by transferring the heat created when water is boiled to the food. This allows steaming to be fast, while the food retains its color and nutrients. Steamers are most often used to cook rice, vegetables, fish, shellfish, meats, and poultry.

This document covers the following topics for steamers:

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### Equipment Description<sup>1</sup>

Steamers come in a variety of configurations, including countertop models, wall-mounted models, and floor models that are mounted on a stand or cabinet-style base. Steamers generally have one to four stacked compartments and are usually designed to accommodate standard 12"x 20"x 2.5" hotel pans.

Steamers are divided into two major categories: **pressure** and **pressureless or convection**. Each type is available in gas, electric, and direct-steam models. Pressure steamers generally have smaller compartments, the doors cannot be opened during cooking, and they are most often used in high volume kitchens like correctional facilities and hotels. Pressure steamers cook food up to twice as fast as pressureless steamers. Pressureless steamers generally have larger compartments, the doors can be opened during cooking, and they are most often used in restaurant applications that have a variety of menu items.



**Figure 1.**  
Pressureless or  
convection  
steamer.



**Figure 2.**  
Pressure  
steamer.

Steam can be generated in a number of ways: through a steam generator located within the compartment, which usually produces steam at or slightly above the compartment pressure; by manually pouring boiling water directly into the cooking compartment before operation (these

<sup>1</sup> Equipment description information and images come in part from the "Buying Guides" at [www.foodservicewarehouse.com](http://www.foodservicewarehouse.com) and from information provided by ENERGY STAR<sup>®</sup>.

units are often called “connectionless” or “boilerless” steamers); or through an external electric, gas, or service-steam powered boiler, also known as “direct steam” and “steam coil”. Internal steam generators require water, drain, and power hookups. Connectionless or boilerless steamers require only power hookups to run the heating elements. Direct steam units require a hookup to acquire steam from the building’s boiler system and a drain line, however, the water used in these units must be clean and certified for use in food production. Direct steam is not very common, however, it is a very inexpensive method to cook food provided the water requirements are met. Steam coil units require a hookup to acquire steam from the building’s boiler system as well as water and drain hookups. Instead of using building steam in direct contact with food, the steam from the building fills a steam coil which is then used to heat clean tap water. This method can be used when the building steam is not certified for use in food production. It is also a very inexpensive way to run a steamer.

Most higher efficiency steamers are manual fill, boilerless units. It is important to note that while this type of steamer can be used in most applications, some models may have a slower recovery time between door openings than automatic fill and boiler-based steamers, and so may not be appropriate for all applications, such as high volume seafood restaurants.

## Product Use and Lifetimes

Steamers are typically operated from 8 to 12 hours per day, 365 days per year. A typical exception to these assumptions is school foodservice facilities, which may shut down all equipment during summer break periods.

Steamers are generally expected to last about 10 years. However, chain restaurants frequently employ an early replacement program so there is no downtime due to equipment failure. Therefore, chain restaurants typically replace their equipment every 3–5 years.

The savings estimates in this document are based on use of 12 hours per day, 365 days per year, which are the assumptions used in the Pacific Gas and Electric (PG&E) Food Service Technology Center (FSTC) [Life Cycle Cost Calculators](#) as of April 2009.

## Specifications and Test Methods

CEE and ENERGY STAR<sup>®</sup> have both developed efficiency specifications for commercial steamers. The CEE specification has two tiers, 1A and 1B, with differing water consumption requirements. The energy efficiency criteria for both tiers is the same, and is also the same as those specified by ENERGY STAR for units accommodating six pans or less. ENERGY STAR does not, however, specify water consumption requirements. Links to the current CEE and ENERGY STAR specifications, qualified product lists, and test method are below. The efficiency criteria and test method are detailed in the specifications.

- CEE Specification  
<http://www.cee1.org/com/com-kit/files/SteamerSpecification.pdf>
- CEE Qualified Product List  
[http://www.cee1.org/com/com-kit/files/steamers\\_prod\\_list.xls](http://www.cee1.org/com/com-kit/files/steamers_prod_list.xls)

- ENERGY STAR Specification and Qualified Product List  
[http://www.energystar.gov/index.cfm?c=steamcookers.pr\\_steamcookers](http://www.energystar.gov/index.cfm?c=steamcookers.pr_steamcookers)
- American Society for Testing and Materials (ASTM) Test Method F1484-05 Standard Test Method for Performance of Steam Cookers  
<http://www.astm.org/Standards/F1484.htm>

### **Note on Interpretation of Test Data**

The data provided in the CEE qualifying products list is based on tests conducted under American Society for Testing and Materials (ASTM) Standard F1484, *Test Method for the Performance of Steam Cookers*. This test method is currently in effect. There are efforts underway at ASTM as of September 2010 that are expected to identify whether or not this test method could be revised to allow for better comparison of automatic and manual fill steamer performance and to provide an appropriate test method for à la carte steamers.

### **Comparison of Test Results**

The current test method, developed several years ago when boiler-based, automatic fill units were more prominent, may result in higher than appropriate cooking energy efficiency results for manual fill steamers depending on the interpretation of the test method. The extent of the difference in test results due to test method interpretation may vary by model.<sup>2</sup> CEE relies entirely on test result information submitted to it by manufacturers in determining product qualification and Tier. But even a 10% variance in performance level values caused by the test-method limitation would not cause CEE to make an erroneous listing on the qualifying products lists from the standpoint of Tier definition. The majority of qualifying manual fill models significantly outperform the minimum cooking energy efficiency requirements. The differences are not expected to impact energy savings of Tier 1A and Tier 1B steamers, which remain significantly higher than non-qualifying models. Test results will be updated upon finalization of the test method revision and completion of testing to the revised procedure.

### **À la carte steamers**

The current test method was not designed for testing of steamers in à la carte cooking applications with frequent door openings. Operators requiring steamers designed for this type of application should seek additional information from manufacturers and equipment dealers regarding the applicability of listed steamers for these applications. In general, recovery time of boilerless steamers after door openings is longer than that of boiler-based steamers.

## **Product Availability**

According to the [North American Association of Food Equipment Manufacturers' directory](#), as of November 2008 there were 21 steamer manufacturers. As of September 2010, there were 12 manufacturers marketing 160 high efficiency steamers meeting CEE Tier 1A specifications:

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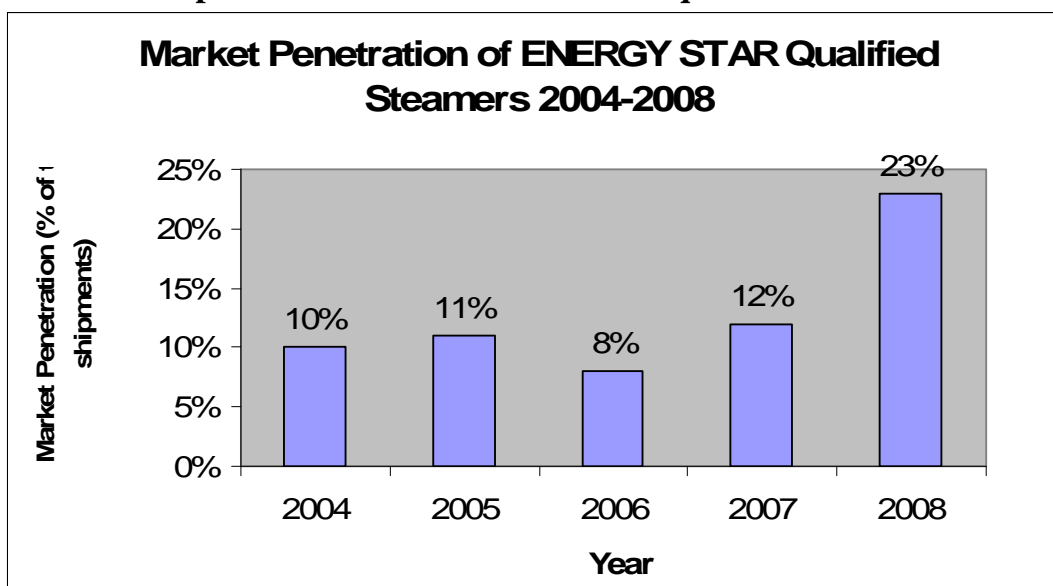
<sup>2</sup> Testing of one model by one manufacturer resulted in a spread of 10 percentage points in cooking energy efficiency results depending on test method interpretation. Additional data on the impact of different test method interpretations are not available at this time.

- [AccuTemp Products, Inc.](#)
- [Blodgett Oven Company](#)
- [Cleveland Range, LLC](#)
- Crown Food Service Equipment Ltd.
- [Hobart Corporation](#)
- [Intek Manufacturing, LLC](#)
- [Market Forge Industries, Inc.](#)
- [Solaris Steam](#)
- [Southbend](#)
- [Stellar Food Equipment](#)
- [Unified Brands, Inc.](#)
- [Vulcan-Hart Co.](#)

Of the qualifying steamers, 148 were electric and 12 were gas.

Market penetration of ENERGY STAR qualified steamers was 23% in 2008 and has ranged between 8% to 23% from 2004 through 2008 (see Figure 3).

**Figure 3. Market penetration of ENERGY STAR qualified steamers 2004 to 2007.**



The percentage of models that meet the CEE Tier 1A and ENERGY STAR specifications varies by steamer size and fuel type.

### Incremental Cost<sup>3</sup>

The following incremental cost analysis is based on estimates of the average list prices for non-qualifying steamers compared to CEE Tier 1A qualified steamers for three, four, five, and six pan units. Pricing for non-qualifying models is based an average of all single compartment, non-

<sup>3</sup> Pricing information is based on list price research conducted in November 2008 using AutoQuotes. AutoQuotes is a database of foodservice equipment available in the U.S. market, including technical characteristics and list price information. End user prices are often calculated as a percent off the list price. End user prices can vary based on a number of factors, including manufacturer, dealer, purchase volume, etc. It is typical to estimate end user prices at approximately 50% off list price, which is the assumption used in this analysis.

qualifying steamers of each size available in AutoQuotes, regardless of steamer type.<sup>4</sup> Pricing for a CEE Tier 1A qualifying steamers is based on an average of all single compartment, qualifying steamers of each size available in AutoQuotes .

The difference in list price and estimated end user price between CEE Tier 1A or ENERGY STAR qualifying steamers and non-qualifying units is shown in Table 1 below for each fuel type and size. Qualifying steamers are often the same price or less expensive than non-qualifying steamers because qualifying steamers are most often boilerless (i.e., a water compartment is filled manually). Removal of the boiler simplifies the technology inside the steamer, reducing its cost. It is important to note, however, that boilerless steamers generally have a lower production capacity and longer recovery time than boiler-based steamers. With boiler-based steamers, the steamer is always ready to go, even after door openings, because steam is constantly being generated. Boilerless steamers take slightly more time to reheat between door openings. For many establishments, the difference in production capacity and recovery time is not significant. However, for operations with high volume, a la carte steaming needs, such as high volume seafood restaurants, boilerless steamers may not be appropriate.

**Table 1. Average Price Differential.**

	# Pans	CEE Tier 1A/ENERGY STAR Qualified Models		Nonqualifying Models		End User Price Differential
		Average List Price	Average End User Price	Average List Price	Average End User Price	
Electric	3	\$8,923	\$4,461	\$8,688	\$4,344	\$117
	4	\$7,898	\$3,949	\$8,584	\$4,292	(\$343)
	5	\$13,000	\$6,500	\$11,777	\$5,889	\$611
	6	\$10,705	\$5,353	\$14,992	\$7,496	(\$2,143)
Gas	3	n/a	n/a	\$11,556	\$5,778	(\$5,778)
	4	n/a	n/a	\$10,917	\$5,459	(\$5,459)
	5	\$16,225	\$8,113	\$19,952	\$9,976	(\$1,863)
	6	\$13,669	\$6,835	\$15,110	\$7,555	(\$721)

## Energy Savings<sup>5</sup>

Steamers designed with energy and water efficiency in mind can save significant amounts of electricity, gas, and water. Design attributes that can help realize these savings include designing for convection of steam, using vacuum pumps to reduce the pressure in the compartment and

<sup>4</sup> While all steamer types were considered in the analysis, the vast majority of steamers included in the data pool were countertop steamers. Pressure steamers generally come in multi-compartment units, and therefore no pressure steamers entered into the data pools. Some floor models did enter into the analysis where applicable, however, floor models are also generally multi-compartment units, so the majority of this type of unit did not enter into the data pool.

<sup>5</sup> The information in this section draws upon Section 8 of the Food Service Technology Center “Commercial Cooking Appliance Technology Assessment,” available at: <http://www.fishnick.com/equipment/techassessment/>. Energy savings were calculated using the Food Service Technology Center calculators located at <http://www.fishnick.com/saveenergy/tools/calculators/> as of April 2009.

thereby lower cooking temperature, using connectionless designs, adding insulation to the compartment, using standby modes that reduce the water temperature to just below the boiling point when not in use, and additional controls allowing for more precise management of the cooking process.

Tables 3 and 4 below depict the estimated energy and water consumption for standard efficiency steamers, CEE Tier 1A or ENERGY STAR qualified steamers, and CEE Tier 1B qualified steamers for each fuel type and size. These calculations were made using the Life Cycle Cost Calculator at [www.fishnick.com](http://www.fishnick.com) as of April 2009 assuming usage of 12 hours per day, 365 days a year.

**Table 2. Estimated Savings for Electric Steamers.**

	Standard Efficiency	CEE Tier 1A / ENERGY STAR Qualifying	Savings CEE Tier 1A / ENERGY STAR vs. Standard Efficiency	CEE Tier 1B Qualifying	Savings CEE Tier 1B vs. Standard Efficiency
<b>Efficiency Criteria pertaining to all sizes</b>					
Cooking Energy Efficiency (Heavy Load Test)	26%	50%	-	50%	-
Average Water Consumption Rate (gal./hour)	40	15	-	4	-
<b>3-pan Steamer</b>					
Idle Energy Rate (watts)	1,000	400	-	400	-
Annual Energy Consumption (kWh)	22,795	8,783	14,012	7,800	14,995
Annual Water Consumption (gal.)	175,200	65,700	109,500	17,520	157,680
<b>4-pan Steamer</b>					
Idle Energy Rate (watts)	1,000	530	-	530	-
Annual Energy Consumption (kWh)	37,539	9,084	28,455	8,089	29,450
Annual Water Consumption (gal.)	175,200	65,700	109,500	17,520	157,680
<b>5-pan Steamer</b>					
Idle Energy Rate (watts)	1,000	670	-	670	-
Annual Energy Consumption (kWh)	56,101	9,407	46,694	8,400	47,701
Annual Water Consumption (gal.)	175,200	65,700	109,500	17,520	157,680
<b>6-pan Steamer</b>					
Idle Energy Rate (watts)	1,000	800	-	800	-
Annual Energy Consumption (kWh)	78,480	9,708	68,772	8,689	69,791
Annual Water Consumption (gal.)	175,200	65,700	109,500	17,520	157,680

**Table 4. Estimated Savings for Gas Steamers.**

	Standard Efficiency	CEE Tier 1A / ENERGY STAR Qualifying	Savings CEE Tier 1A / ENERGY STAR vs. Standard Efficiency	CEE Tier 1B Qualifying	Savings CEE Tier 1B vs. Standard Efficiency
<b>Efficiency Criteria pertaining to all sizes</b>					
Cooking Energy Efficiency (Heavy Load Test)	15%	38%	-	38%	-
Average Water Consumption Rate (gal./hour)	40	15	-	4	-
<b>3-pan Steamer</b>					
Idle Energy Rate (Btu/hour)	8,000	6,250	-	6,250	-
Annual Energy Consumption (therms)	1,178	513	665	464	714
Annual Water Consumption (gal.)	175,200	65,700	109,500	17,520	157,680
<b>4-pan Steamer</b>					
Idle Energy Rate (Btu/hour)	8,000	8,350	-	8,350	-
Annual Energy Consumption (therms)	1,874	561	1313	511	1,363
Annual Water Consumption (gallons)	175,200	65,700	109,500	17,520	157,680
<b>5-pan Steamer</b>					
Idle Energy Rate (Btu/hour)	8,000	10,400	-	10,400	-
Annual Energy Consumption (therms)	2,738	608	2130	557	2,181
Annual Water Consumption (gallons)	175,200	65,700	109,500	17,520	157,680
<b>6-pan Steamer</b>					
Idle Energy Rate (btu/hour)	8,000	12,500	-	12,500	-
Annual Energy Consumption (therms)	3,769	657	3,112	603	3,166
Annual Water Consumption (gallons)	175,200	65,700	109,500	17,520	157,680

### Program Design Tips

- ✓ While there has been very little monitoring of actual steamer hours of operation, the FSTC has published a study, [Evaluating the Water Savings Potential of Commercial "Connectionless" Food Steamers](#), which details the operation of steamers in 12 foodservice establishments in California.

### Additional Resources

- [ENERGY STAR Steamers Web page: http://www.energystar.gov/index.cfm?c=steamcookers.pr\\_steamcookers](http://www.energystar.gov/index.cfm?c=steamcookers.pr_steamcookers). ENERGY STAR includes specifications, qualified product lists, case studies, and general savings

information about commercial steamers. Links to other commercial foodservice equipment categories are also provided.

- [Pacific Gas and Electric Food Service Technology Center Life Cycle Cost Calculators](http://www.fishnick.com/saveenergy/tools/calculators/): <http://www.fishnick.com/saveenergy/tools/calculators/>. On this Web page, the FSTC provides life cycle cost calculators for gas and electric steamers with the ability for users to modify steamer performance, usage, and utility rate characteristics. Calculators for other commercial cooking equipment categories are also provided.
- [Pacific Gas and Electric Food Service Technology Center Commercial Kitchen Appliance Technology Assessment](http://www.fishnick.com/equipment/techassessment/): <http://www.fishnick.com/equipment/techassessment/>. On this Web page, the FSTC provides a comprehensive description and energy performance assessment for commercial steamers and other commercial cooking equipment categories.