Research and Analyze Commercial Foodservice Technologies

Project Number ET22SWG0003

Prepared by ICF for submission to Southern California Gas Company

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Abbreviations and Acronyms

Abbreviation	Meaning
CEC	California Energy Commission
CEE	Consortium for Energy Efficiency
CFS	Commercial Foodservice
EE	Energy Efficient
FSR	Full-Service Restaurant
GET	Gas Emerging Technologies
HTR	Hard-to-Reach
IOU	Investor-Owned Utility
PG Study	2021 Potential and Goals Study
PG&E	Pacific Gas & Electric
QPL	California Energy Wise Instant Rebates Qualified Products List
QSR	Quick Service Restaurant
ROI	Return on Investment
SCG	Southern California Gas Company
SDG&E	San Diego Gas & Electric
TRC	Total Resource Cost
TSB	Total System Benefit

Executive Summary

The Gas Emerging Technologies (GET) program initiated a market study to analyze and research commercial foodservice (CFS) technology adoption trends in existing California investor-owned utilities (IOUs) energy efficiency (EE) incentive programs; perform primary and secondary market research to understand technology adoption drivers and barriers; calculate market potentials for EE CFS technologies; and provide actionable recommendations to guide GET investment in future research activities. The primary impetus for this study came from the 2021 EE Potential and Goals Study Results Viewer (California Public Utilities Commission, 2021), which found that the food service market sector has the third-highest incremental achievable gas EE potential in the commercial sector in California.

Project Goal: The goal of this study was to gather EE program participation and market data on energy-efficient commercial foodservice technologies to provide an understanding of programmatic uptake and related drivers and barriers for these technologies.

Technology Description: This study included analyzing the historical EE program participation data for all CFS related EE measures that have an existing approved measure package. Following that, four (4) high-priority technologies were selected for a deeper analysis. These technologies were:

1) Griddles
2) Underfired broilers
3) Automatic conveyor broilers
4) Steam tables

Key Project Findings:

- Restaurant owner and manager interviews uncovered many non-energy advantages provided by EE CFS equipment that can be leveraged to make the case for the higher cost of EE CFS equipment. These include:
    - Better control over temperature setpoints
    - Faster cooking times/increased food output capacity
    - Higher food quality
    - Smaller and more ergonomic designs freeing up kitchen space and/or increasing operator comfort/reducing risk of heat-related illness and labor savings

- The top three (3) barriers to EE CFS equipment are:
    - High up-front costs,
    - Current supply-chain issues
    - Lack of awareness of EE CFS products
    - Other barriers include:
        - Fragmented market
        - Lack of readily available EE CFS supply
        - Misconception that energy efficiency is achieved at the cost of performance
        - Additional maintenance requirements of EE CFS equipment
        - Need for maintenance personnel training
- The top three (3) drivers for EE CFS equipment are:
    - Improved performance
    - Labor savings
    - Consolidating kitchen operations
- There is potential to create a Tier I/Tier II measure package approach for griddles.
- A Tier I/Tier II measure package approach for underfired broilers isn't supported using publicly available cost data, but some cost data is missing.
- There is a need for more customer education to select appropriate equipment.
- Customers use conveyor broilers, underfired broilers, and griddles to cook similar foods. There is an opportunity to quantify energy intensity per pound of food output to compare these technologies.
- Steam table customer survey results combined with a prior emerging technology study show that 22% of steam tables are gas-fired, but 97% of existing steam tables (gas and electric) are inefficient wet-well steam tables. The sample size in this study was not large enough to confirm a trend, but if the prevalence of wet-well steam tables holds for gas-fired steam tables, there is potential for replacement of gas-fired wet-well steam tables with gas-fired dry-well steam tables to be impactful.
- Steam table customer survey results show similar annual hours of operation to prior reports.

Project Recommendations: The Study Team offers the following recommendations based on the findings:

- Conduct studies for EE griddles, EE underfired broilers, and EE automatic conveyor broilers to quantify/understand the non-EE benefits to support outreach events and/or marketing efforts
- Create a customer energy cost savings tool to quantify energy cost savings and return-on-investment (ROI)
- Communicate customer education and workforce training needs to the appropriate entities
- Revise existing griddle measure package to a Tier I/Tier II approach to align with the product capabilities
- Gather missing cost data from manufacturer for the highest efficiency underfired broilers and recalculate potential customer ROI and measure TRC
- Undertake a study to compare the energy use and overall cost of cooking foods with griddles, underfired broilers, and automatic conveyor broilers to quantify an energy and cost/lb of food metric to support marketing efforts
- Conduct a study of source energy, source emissions, and cost per pound of food production for EE CFS equipment
- Perform a separate steam table market assessment to determine the existing share of custom/manufactured, dry-well/wet-well, and electric/gas steam tables, and determine key operating parameters

Introduction

According to the most recent California Commercial End-Use Survey[1], restaurants have the highest annual natural gas energy intensities of all commercial buildings in California (Itron, KEMA, ADM Associates, James J. Hirsch & Associates, 2006). According to the 2021 EE Potential and Goals Study (PG Study) Results Viewer, commercial foodservice (CFS) measures have the third highest incremental achievable potential for gas energy savings (California Public Utilities Commission, 2021). However, the incremental achievable potential is far below the technical potential which points to underlying adoption barriers in the CFS market. Gas-fired cooking equipment is the predominant type of equipment used in commercial kitchens and many manufacturers have more efficient alternatives that are ENERGY STAR® certified. However, there are various nuances in the CFS industry that create market entry barriers for EE equipment. These include:

1) High first costs of the equipment and thin profit margins
2) Complex controls included in the EE technologies and a lack of user training
3) In some instances, there is a perceived reduction in equipment performance resulting in lower quality food output
4) Some equipment in a commercial kitchen is leased which makes the value-proposition harder for both the end-use customer and the leasing company

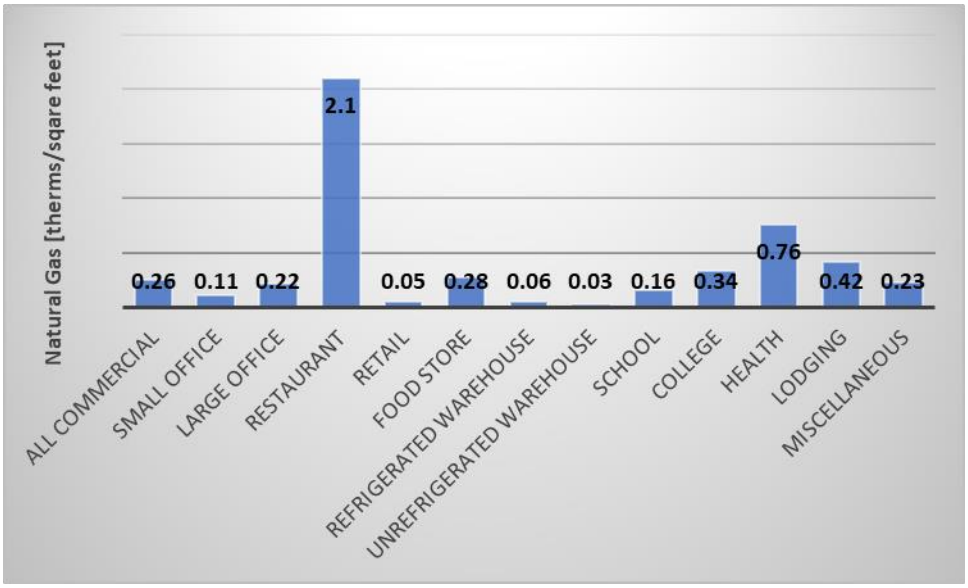
This Emerging Technology (ET) study further investigates these known market barriers and uncovers other market barriers by performing a market barrier literature review, analyzing EE technology adoption trends, performing market potential calculations and gaining feedback on EE CFS equipment by interviewing subject matter experts (SMEs) and restaurant owners/managers who have installed EE equipment and received an EE incentive from California IOUs. The goal of this project is to provide actionable recommendations to improve adoption of high potential EE CFS measures and recommend technologies for further field testing/evaluation. This project examined direct natural gas fired CFS equipment and CFS equipment that uses hot water including convection ovens, steamers, fryers, combination ovens, conveyor ovens, griddles, conveyor broilers, rack ovens, steam tables and dishwashers.

[1] The latest publicly available California Commercial End-Use Survey is from 2006. At the time of this writing, the results from the most recent study completed in 2022 are not yet available.

Background

Based upon the most recent California Commercial End-Use Survey data (Itron, KEMA, ADM Associates, James J. Hirsch & Associates, 2006), restaurants have the highest natural gas energy intensity than any other commercial building type by far as shown in Figure 1.

Figure 1: Annual Natural Gas Energy Use Intensities from CEUS



Restaurants have an annual natural gas energy use intensity of 2.1 therms/ft^2 while the average intensity for all commercial buildings is 0.26 therms/ft^2. The energy use in foodservice is dominated by cooking equipment (Consortium for Energy Efficiency, 2021). A recent study by the California Energy Commission (CEC) estimates that there are 93,300 commercial foodservice facilities in California which use about 560,00 commercial natural gas-fired cooking appliances (California Energy Commission, 2021). The high energy intensity in commercial kitchens combined with the large number of natural-gas fired appliances means this is an important sector for the GET program to investigate.

Figure 2 shows that foodservice measures have the third highest incremental achievable potential after the Behavioral, Retro-commissioning and Operational (BRO) and water heating measures for gas energy savings (California Public Utilities Commission, 2021). Table 1 shows the filters applied to the PG Study Results Viewer to extract results shown in Figure 2.

Figure 2: PG Study Viewer Incremental Achievable Potential Breakdown for BROs, WaterHeat & FoodServ

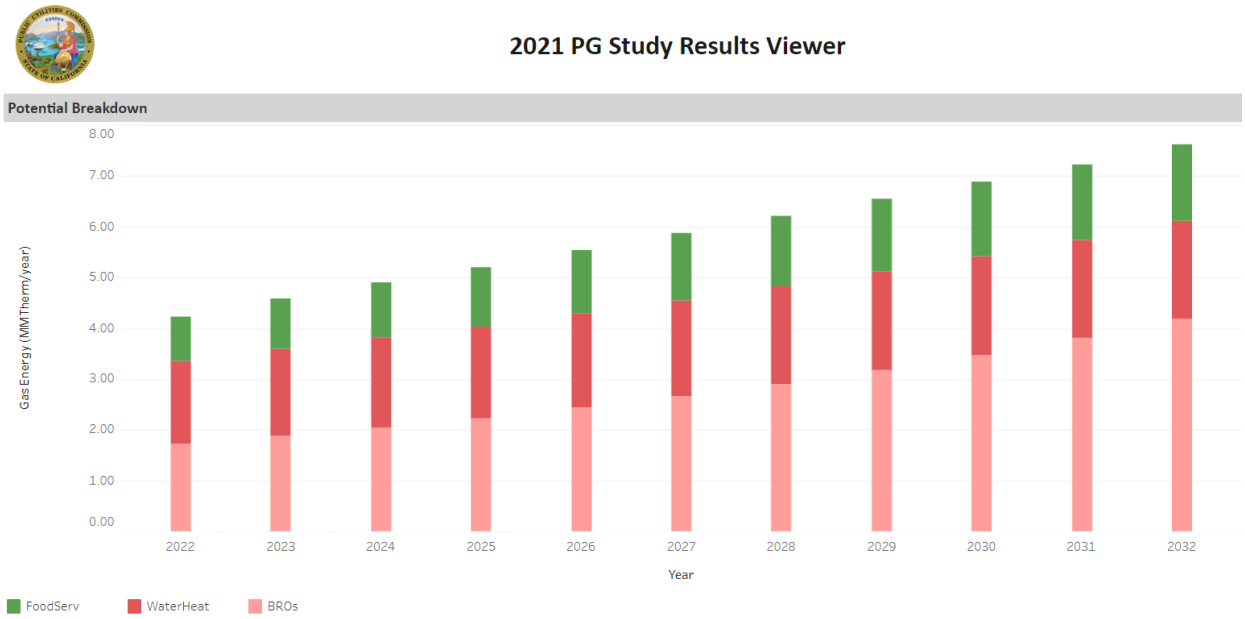


Table 1: PG Study Filters Applied for Figure 2

Category	Value
Viewer	Potential Breakdown
Breakdown Category	End Use
Savings Type	Gas Energy (MMTherms/year)
Scenario	Scenario 2: TRC Reference
Potential Type	Incremental Achievable Potential
Sector	Com
End Use	BROs, WaterHeat, FoodServ
Utility	All
Measure Type	Energy Efficiency

The Incremental Achievable Potential is significantly lower than the Technical Potential which points to underlying barriers in the market (See Figure 3 and Table 2). This study investigated the CFS market further to uncover the nuances of market barriers and provide recommendations to move technologies into field studies or pilots to increase adoption.

It is also worth noting, with the backdrop of the COVID19 pandemic, the CFS market has undergone changes that must be addressed going forward. Consolidation of kitchen

operations into a commissary kitchen service serving multiple restaurants at the same time is an evolving theme. On the other hand, it is still not clear how supply chain issues are affecting the availability of EE equipment. This project attempted to uncover these evolving trends through manufacturer, distributor, and restaurant owner/manager interviews.

Figure 3: PG Study FoodServ Incremental Achievable Potential vs. Technical Potential

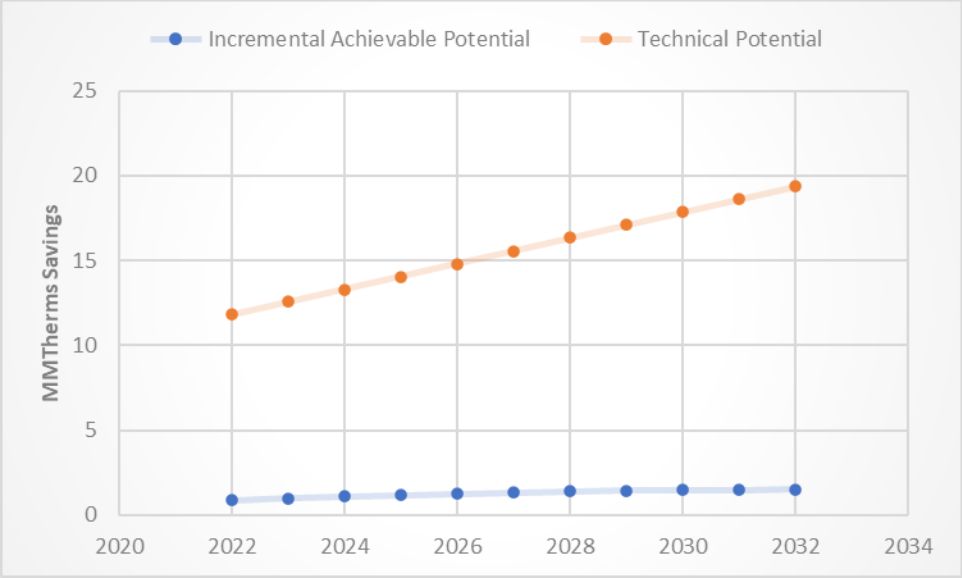


Table 2: PG Study Filters Applied for Figure 3

Category	Value
Viewer	Potential Breakdown
Breakdown Category	End Use
Savings Type	Gas Energy (MMTherms/year)
Scenario	Scenario 2: TRC Reference
Potential Type	Incremental Achievable Potential / Technical Potential
Sector	Com
End Use	FoodServ
Utility	All
Measure Type	Energy Efficiency

Assessment Objectives

The goal of this study is to examine publicly available information on market barriers for EE CFS equipment, analyze historical CFS participation data, perform market potential calculations and get feedback from SMEs and restaurant owners/manager to:

1) Understand barriers to installation and operation of EE CFS and gather feedback to inform GET about how to reduce the barriers

2) Uncover any unknown operational advantages and/or disadvantages of EE CFS equipment

3) Determine next steps for possible steam table measures from the prior ET study (Frontier Energy, 2020), CPUC draft measure package review comments[2], and SME interviews

4) Provide recommendations for improving EE CFS equipment adoption

5) Provide recommendations for further field testing and/or pilot projects

The expected outcomes of the project include:

1) Identification of specific barriers impacting adoption of CFS equipment and additional data/information required to inform strategies on how to overcome the barriers specific to the four (4) technologies selected

2) Recommendations for further study and/or potential projects/pilots in CFS

Market Barrier Literature Review

The first step of this project was to review existing literature documenting barriers to EE and customer feedback in the CFS market. A review of existing literature was performed to summarize known market barriers and advantages/disadvantages of installing and operating EE CFS equipment. The purpose of this initial task was to inform the historical EE participation analysis as well as develop survey questionnaires for SMEs and restaurant owners/managers.

Broadly speaking, this literature review is split into market-related studies and technology related studies. Market-related studies cover specific market conditions and behavior. Technology related studies evaluate technology specific details such as customer response

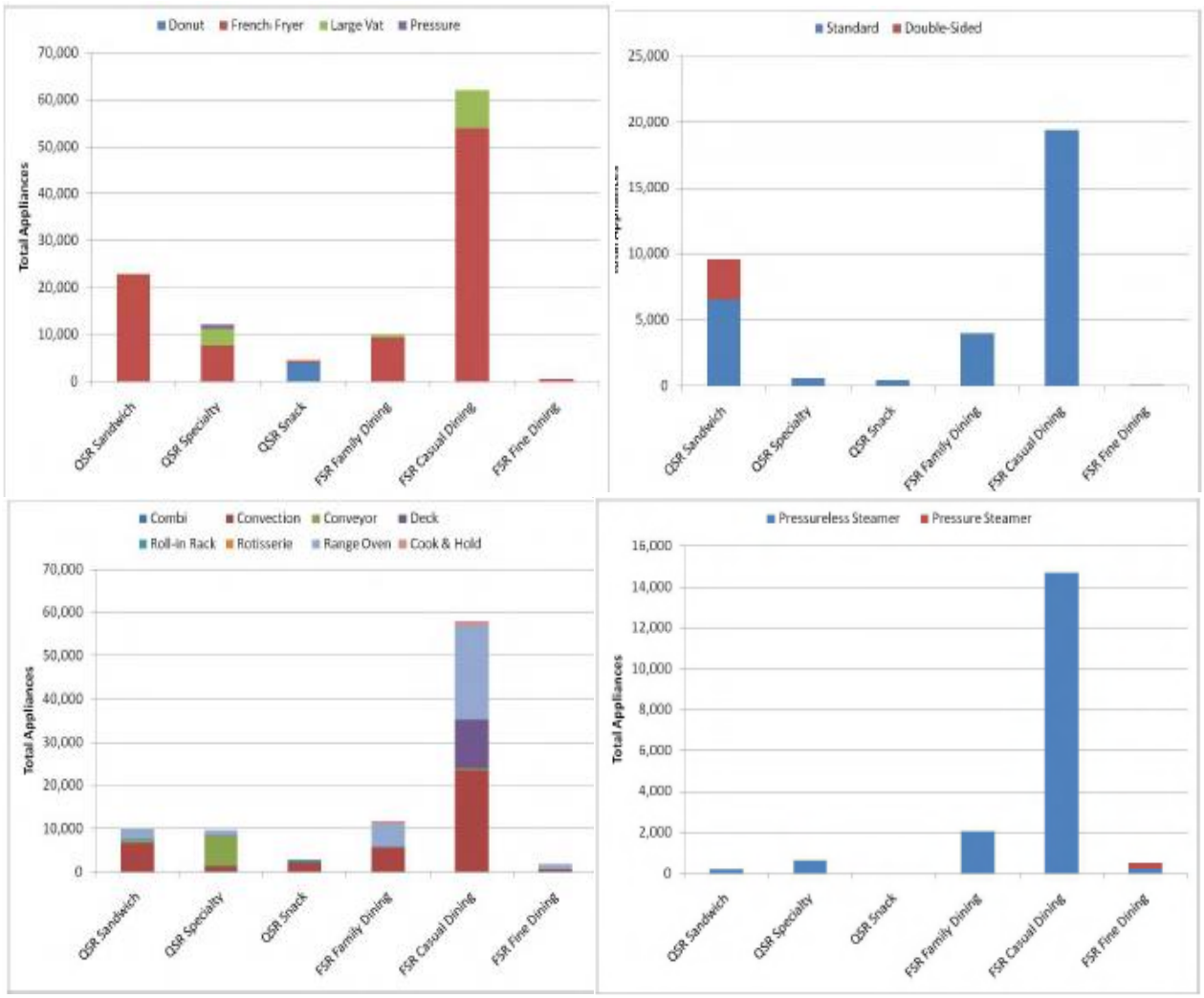
[2] Review of CPUC comments on steam table draft measure package was added partway through this study.

to using new technology, incremental product costs, and technology specific characteristics that may help to drive up adoption.

Market Studies

Pacific Gas and Electric Company (PG&E) released a study (Pacific Gas and Electric, 2012) characterizing the CFS equipment market in the year 2012. The study also focused on characterizing the distribution of kitchen appliances within the various CFS subsectors such as Quick Service Restaurants (QSR) and Full-Service Restaurants (FSR), which were then further subdivided into QSR Sandwich, QSR Specialty, QSR Snack, FSR Family Dining, FSR Casual Dining, and FSR Fine Dining subsectors. The study specifically evaluated french fryers, griddles, steam cookers, and ovens. The study found that FSR Casual Dining was the subsector with the largest concentration of appliances with either QSR Sandwich or FSR Family Dining coming in at a distant second place. FSR Casual Dining accounted for a significant majority of kitchen appliance use in California as shown in Figure 4.

Figure 4: Appliance Distribution: Clockwise from top left, Fryer, Griddle, Steam Cooker, and Oven (Pacific Gas and Electric, 2012)



An ENERGY STAR publication (ENERGY STAR, 2013) indicated that an effective EE program design should consider these following common market barriers in the CFS market:

1) Hard-to-reach market: Fragmented market with a diverse supply channel and end uses. An additional nuance in this barrier is that supply channels include new equipment as well as used equipment. Much of the low efficiency used equipment is purchased and used by CFS customers which also acts as a barrier to high efficiency equipment.
2) Lack of readily available supply: Due to the competitive nature of this market and suppliers competing for low prices, it is typical for them to only stock low quantities of energy-efficient products. This is further compounded by the fact that customer decisions are usually made in the short term and typically when equipment fails.

3) Increased Costs: EE equipment in the CFS sector tends to be more expensive.
4) Lack of Knowledge: Customers are usually unaware of the many advantages of EE equipment. There is also a common misconception that energy efficiency is achieved at the cost of equipment performance.

As a part of a Process Evaluation completed of the Food Service Technology Center (FSTC) operations in PG&E territory (PA Consulting Group, 2008), the study also explored a "Market Actor Overview" by interviewing Manufacturers, National Chains and End-users. Most of the manufacturers interviewed specifically targeted chains and there was no concerted strategy for other segments of the CFS sector. The interviewees represented quite a range of operations including international, national, and regional markets. Therefore, the results may be considered representative of the market.

Responses from National Chain customers indicated a varying level of internal and external staff involvement in the design process and equipment selection. It was reported by one respondent that in their case, the franchisee gets to pick equipment from a list and that there is resistance in dropping less efficient equipment from the list. This probably indicates that decisions are based on first cost rather than a lifecycle cost analysis. Another issue reported for chain operations is that franchisees are not required to use corporate equipment specifications. Franchisees are only required to follow specifications per a recipe. However, franchisees may benefit from using corporate specifications since the franchisees may benefit from bulk order discounts. This represents an opportunity to influence corporate decision makers to carry more EE equipment in their specifications to franchisees.

End-user surveys showed an overwhelmingly high participation rate from independent operators. Based on this study, independent operators also represented a large number of non-participants which may indicate that independently owned restaurants form a substantial portion of PG&E's food service end-users.

To further evaluate this assumption, another study was reviewed that looked at the distribution of various restaurant types in Los Angeles County (Centers of Disease Control and Prevention, 2019). While this study does not specifically address CFS needs per se, it provides important information regarding restaurant types and their distribution. The study estimated that within LA County, 26.5% of restaurants are large chains, 11.3% are small chains and 62.2% are independently owned/operated. The study further reported that large chain restaurants were more likely to be quick service or fast casual. The study reported that 66.2% of large chains were quick service and 21.5% were fast casual. With independent restaurants, 29.9% and 5.7% were quick service and fast casual respectively. The CDC study did not directly state how many full-service casual restaurants are independent. However, 64.4% of independent restaurants were either mid-scale dining, casual dining, or fine dining

and 19.0% and 26.7% (45.7% total) of all restaurants are mid-scale and casual dining, respectively (only 2.5% of all restaurants were fine dining).

Given that the largest concentration of appliances is within the full-service casual dining subsegment, independent restaurants make up a substantial portion of this segment if the numbers above hold true within the rest of California. Therefore, manufacturers focus on large chains leaves out a significant portion of independent restaurants for EE technology exposure and adoption.

Additionally, private communications with a member of the GET Team who has knowledge of the ENERGY STAR program and qualification process, indicates that most CFS restaurant owners are looking for return on investments (ROI) of 1-2 years. There is no guarantee that their restaurant will be operating after two years due to the high business turnover rate in the CFS sector. Therefore, investments with a longer payback period are very risky unless it is factors beyond ROI that are driving their decision making (Clinger, 2023).

Technology Studies

Available field studies, program guides and demonstration project reports were reviewed to identify technology specific issues. Fryers, griddles, convection ovens, steam cookers, steam tables, and rack ovens were short-listed based on available information. These were selected since they are also the most prevalent appliances in the industry. In general, the results from previous studies were positive vis-à-vis adoption of EE appliances. Customers mostly reported increased productivity while meeting operator needs at a lower energy usage. This is in direct contradiction to CFS customer perception that energy efficiency typically means sacrificing production capacity.

None of the studies reported EE equipment needing significant additional plumbing or building alteration to accommodate the replacement units. This is an important consideration for EE equipment adoption in this sector. Requiring significant additional work to accommodate EE replacement units will further drive-up costs to the customer.

Griddle

Based on the PG&E study (Pacific Gas and Electric, 2012), new EE griddle units helped the customer/operator with a seamless cooking experience as they no longer need to switch between multiple surfaces when cooking multiple foods on their production line. The typical baseline setup uses non-thermostatic, manually controlled griddles, but newer griddles offer temperature control across multiple sections of the equipment. However, there is a need to explore the real-world energy use of non-thermostatic, manually controlled griddles because there are subtle variances in baseline operation affected by human users that impacts actual energy savings when upgrading to a thermostatically controlled griddle.

Convection Oven

Based on a program guide published by Consortium for Energy Efficiency (Consortium for Energy Efficiency, 2015), customers that have installed EE convection ovens have reported increased productivity with faster cook times enabling them to consolidate operations thus saving even more energy. Consolidating operations also allowed certain customers to offer additional items on their menu which would have required separate dedicated equipment. Another operator reported higher production capacity with the new EE units. One operator reported that the performance is as good as, if not better than, the replaced unit.

Based on a CEE publication (Consortium for Energy Efficiency, 2015), there is no incremental price increase for more efficient products. This means that energy efficient units are not more or less expensive than existing baseline units and customers need to be educated properly so that they can make the best choice for themselves. The program guide also mentions that the estimated life of the more efficient unit was estimated to be higher than its low efficiency counterpart by "one industry expert." However, the industry accepted lifespan, regardless of low/high efficiency unit, is 12 years (California Energy Wise, 2022), (ENERGY STAR, 2022). This suggests that some additional work is necessary to determine the useful life of this equipment.

Steam Cooker

Based on a CEC study (California Energy Commission, 2021), one operator was not happy with the performance/reliability of the EE unit. The door gaskets on the new units began to fail resulting in steam escaping from the cooking compartment. This ultimately resulted in the unit not being able to meet production needs. It needs to be further investigated to see if this was an exception to the rule or if EE steam cookers do experience reliability issues on a regular basis.

The CEE Program Guide for commercial steamers (Consortium for Energy Efficiency, September 2010) estimates using ENERGY STAR data that the incremental cost of EE steamers is negative due the fact that EE steam cookers are always boiler-less. It is also noted that boiler-less steamers have lower production capacity which will be a major barrier for high volume operations.

Steam Table

Based on a study completed by Frontier Energy for Southern California Gas (SoCalGas) and San Diego Gas and Electric (SDG&E), steam tables show great potential to reduce energy consumption (Frontier Energy, 2020). While electric steam tables are more popular in the rest of the country, Southern California restaurant owners prefer gas fired steam tables. The study concluded through market analysis that customers may be willing to replace their existing inefficient units with more efficient units if they saved more than $300/year in

energy costs. A survey of gas fired steam tables showed that more than 70% of the units operating in the market are not efficient.

The study found that the EE units do not save as much energy if the steam tables pans are not covered with a lid. Therefore, the application of this technology should be properly evaluated before considering the upgrade to the more energy efficient unit.

Rack Ovens

Based on the published CEE program guide (Consortium for Energy Efficiency, 2015), the incremental cost of rack ovens is estimated to be $8,646. Assuming 12 hours/day of operation for 365 days, it is estimated that units will save anywhere from 1,100 – 1,200 therms per year. At a $1/Therm, the incremental cost is expected to payback within 8 years compared to a 12-year estimated useful life. However, if the project economics change due to lower operational hours or lower fuel cost, it will be tough to justify the high incremental cost of these units. Additionally, restaurant owners generally want a payback of 2 years or less, so the payback of 8 years may not be attractive to them even though equipment life is 12 years.

High Priority CFS Measures

While there have been EE technology advancements in the CFS market recent years, there were no obvious candidates for further research/testing under the GET program for various reasons. Therefore, the GET program decided to select three (3) existing CFS measures for which there are already measure packages, but for which there is the potential to improve EE program participation. In addition, there was a recent ET study done by Frontier Energy on Steam Tables (Frontier Energy, 2020) which do not have a measure package yet and the GET program decided to investigate this measure further as well.

The three (3) selected existing EE CFS measures along with the steam tables resulted in a total of four (4) high priority CFS measures which were the focus of the rest of this project. Selection of the (3) existing EE CFS measures was based upon an analysis of the statewide claims data from 2017-2021, the measure Total Resource Costs (TRCs) and Total System Benefits (TSBs), first costs from measure packages, and feedback from So Cal Gas utility representatives.

Historical Participation Data

Yearly statewide savings claims data was downloaded from the California Energy Data and Reporting System (CEDARS) from 2017 -2021 (CEDARS, 2022). Power pivot tables were used to sort and analyze the data. Filters and mapping from measure ID to standard statewide measure names were applied to the data so total yearly net therms and yearly net installations could be summarized on a measure-level and program-level basis across multiple years. The Codes and Standards programs were sorted out of the data, and the data was further filtered to show only Commercial sector programs with the "Food Service" Use Category. Measure ID and Program Name were displayed with their corresponding "First Year Net Therm" and "Count of First Year Net Therm." "Count of First Year Net Therm" was used as a proxy for the number of installations because the normalizing unit for each measure varies. For example, when the normalizing unit is "length" and a 3-foot product is installed, the number of units would be three (3), but only one (1) piece of equipment would have been installed. In this case, the "Count of First Year Net Therm" would be one (1) corresponding to one (1) claim row in CEDARS data and one (1) piece of equipment installed. This is an approximate number. It is unknown how many claim rows would be in CEDARS data if a single customer installed two (2) 3-foot products. There might be two (2) claim rows with three (3) units each, or there might be one (1) claim row with six (6) units. CEDARS data does not have customer identifying information so there is no way to determine this.

Program-Level

The statewide yearly claims were further sorted to show which food service programs have delivered the highest therms savings. Table 3 summarizes the yearly net therms savings for EE CFS measures in commercial programs from 2017-2021. Additional commercial programs may have claimed EE CFS measures, but the table below encompasses 99-100% of the EE CFS measure therms savings in commercial sector.

Table 3: Yearly Net Therms Savings by Program

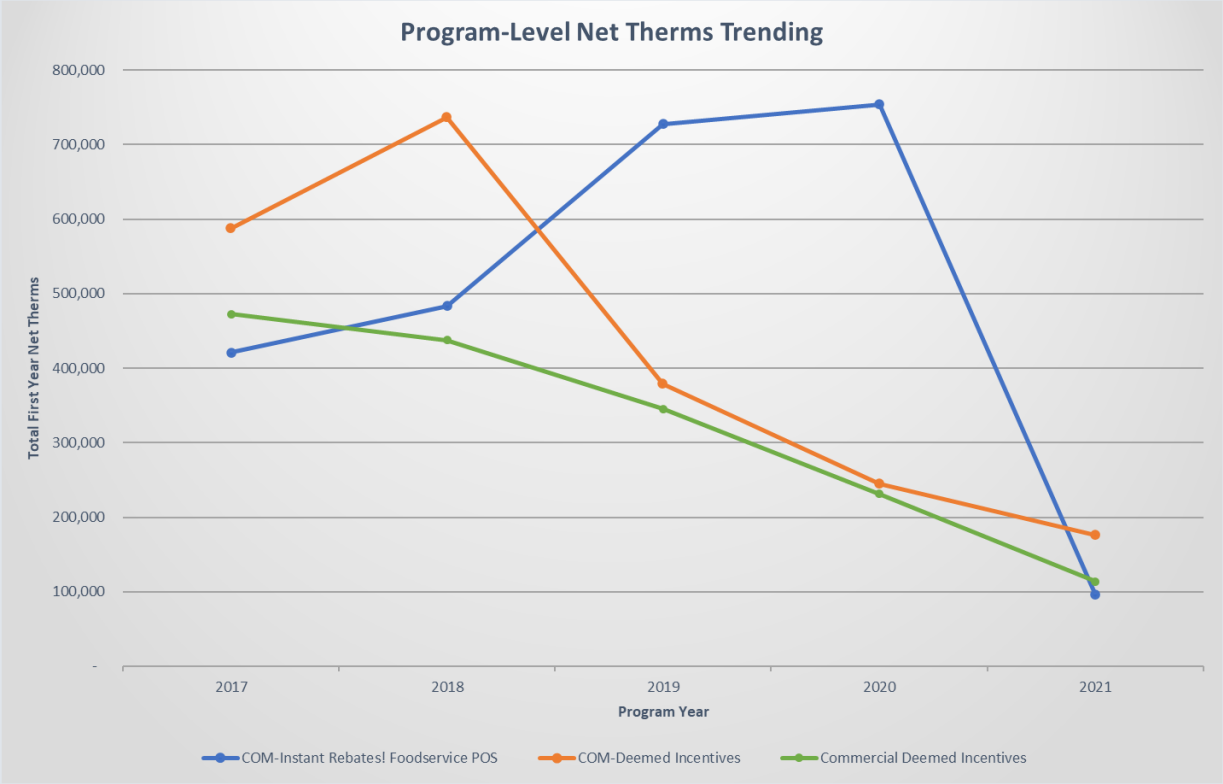
	Therms Savings						
Program Name	**2017**	**2018**	**2019**	**2020**	**2021**	**Total**	**% Of Total**
COM-Instant Rebates! Foodservice POS	420,793	483,291	727,657	754,202	95,776	2,481,718	36%
COM-Deemed Incentives	587,723	736,671	378,900	244,589	175,493	2,123,375	31%
Commercial Deemed Incentives	472,472	437,868	345,150	231,467	113,681	1,600,638	23%
PUB-Deemed Incentives	-	-	366,698	1,476	1,286	369,461	5%
Hospitality Program	13,506	72,353	1,536	-	-	87,395	1%
SW-COM-Deemed Incentives-Commercial Rebates	28,352	35,746	8,518	8,398	-	81,014	1%
COM-Direct Install Program	1,170	32,681	24,603	21,556	73	80,082	1%
COM-Calculated Incentives	36,868	15,667	-	-	940	53,474	1%
School Energy Efficiency	-	1,950	9,036	10,990	-	21,976	0%
Commercial Large Customer Services (>20KW) Program	-	-	-	-	5,499	5,499	0%
Total	1,560,882	1,816,227	1,862,097	1,272,677	392,748	6,904,631	

The programs with the largest quantity of net therms savings were:

1) COM-Deemed Incentives
2) COM-Instant Rebates! Foodservice POS
3) Commercial Deemed Incentives

These programs encompass 90% of the total net therms savings between 2017-2021. Figure 5 below shows the yearly net therm savings for each program.

Figure 5: Program-Level Net Therms Trends 2017-2021



"COM-Deemed Incentives" is a SoCalGas Downstream program, "Commercial Deemed Incentives" is a PG&E Downstream program, and "COM-Instant Rebates! Foodservice POS" is a SoCalGas Midstream program. Figure 5 shows "COM-Instant Rebates! Foodservice POS" was the largest program to receive CFS rebates in 2019 and 2020. The statewide claims data from 2021 had much lower energy savings claims across all programs, so it should not be considered a representative year. Utility representatives at SoCalGas indicated that as of April 2021, "COM-Instant Rebates! Foodservice POS" is now a statewide midstream program run by a third-party implementer. All three (3) of the aforementioned programs are promising avenues for GET program to focus to drive higher EE market adoption.

This analysis was also done by showing net installations at a program level. Those tables and charts are available in Appendix I. They follow similar trends to the net therms trends shown above.

Measure Level

The statewide yearly claims were also broken down to see the total net therms and total installations per year by measure. Table 4 shows a summarized version of that data with the total yearly net therms, total net therms for 2017-2021 period, and the TRC for each measure.

Table 5 shown the total number of yearly installations for each measure.

Table 4: Yearly Net Therms Savings by Measure

		Yearly Net Therms					
Measure	**TRC**	**2017**	**2018**	**2019**	**2020**	**2021**	**Total**
Convection Oven, Commercial	1.05	136,750	140,825	123,100	88,965	18,971	508,611
Combination Oven, Commercial	2.45	105,144	105,663	173,608	144,479	48,788	577,682
Griddle, Commercial	1.59	23,997	12,449	26,372	29,402	16,726	108,945
Steamer, Commercial	3.40	58,258	145,580	416,627	8,223	2,467	631,154
Conveyor Oven, Gas, Commercial	1.63	83,892	58,609	12,641	4,115	6,312	165,568
Fryer, Commercial	1.51	884,006	1,047,940	938,779	924,694	257,621	4,053,040
Automatic Conveyor Broiler, Commercial	7.80	-	24,236	38,734	26,464	30,368	119,802
Undercounter Dishwasher, Commercial	1.31	-	-	-	-	-	-
Underfired Broiler, Commercial	2.30	-	-	589	3,107	1,612	5,307
Door-Type Dishwasher, Commercial	0.92	309	-	773	-	-	1,082
Exhaust Hood Demand Controlled Ventilation, Commercial	0.80	27,628	17,822	2,013	197	-	47,661
Low-Flow Pre-rinse Spray Valve	5.54	24,534	146,000	26,354	25,181	562	222,631
Rack Oven, Gas, Commercial	0.99	191,780	120,349	114,878	23,860	8,743	459,609

Table 5: Yearly Installations by Measure

		Yearly Installations					
Measure	**TRC**	**2017**	**2018**	**2019**	**2020**	**2021**	**Total**
Convection Oven, Commercial	1.05	525	587	462	403	126	2,103
Combination Oven, Commercial	2.45	142	144	265	218	82	851
Griddle, Commercial	1.59	88	46	71	82	95	382
Steamer, Commercial	3.40	46	99	181	11	5	342
Conveyor Oven, Gas, Commercial	1.63	183	101	20	10	19	333
Fryer, Commercial	1.51	2,136	2,481	2,139	2,554	910	10,220
Automatic Conveyor Broiler, Commercial	7.80	-	11	23	18	16	68
Undercounter Dishwasher, Commercial	1.31	-	-	-	-	-	-
Underfired Broiler, Commercial	2.30	-	-	2	6	4	12
Door-Type Dishwasher, Commercial	0.92	2	-	5	-	-	7
Exhaust Hood Demand Controlled Ventilation, Commercial	0.80	52	30	4	1	-	87
Low-Flow Pre-rinse Spray Valve	5.54	869	4,535	1,874	1,737	52	9,067
Rack Oven, Gas, Commercial	0.99	114	80	70	53	23	340

The CFS measure with the most therm savings is Commercial Fryers. The Study Team did not select this measure as a high priority CFS measure because it outperforms all other CFS measures by at least six (6) times, so it is unlikely that it needs additional ET efforts to increase participation. Measures with a TRC of less than 1.0 ("Door-Type Dishwasher, Commercial," "Exhaust Hood Demand Controlled Ventilation, Commercial," "Rack Oven, Gas, Commercial") were also not selected as high priority since they are much less cost-effective than the target portfolio TRC of 1.25. The measures "Low-Flow Pre-rinse Spray Valve" and "Undercounter Dishwasher, Commercial" have a TRC of greater than 1.0 but are not used directly for cooking food, so they were also not selected for detailed analysis. The following CFS measures were considered in the selection of high priority measures:

- Convection Oven, Commercial
- Combination Oven, Commercial
- Griddle, Commercial
- Steamer, Commercial
- Conveyor Oven, Gas, Commercial
- Automatic Conveyor Broiler, Commercial
- Underfired Broiler, Commercial

Utility Representative Interviews

A meeting was held with SoCalGas utility representatives who are SMEs in commercial foodservice to get their feedback on the measures that were candidates for high priority. The following feedback was received:

- There is potential to offer a higher incentive for Griddles and Underfired Broilers because the highest efficiency models are much more efficient than the rest of the qualified products.
- Synergy Garland recently released their new line of qualified products, and though they are on the qualified products list, there has not been much traction because these are still emerging in the market. The burner technology in the Synergy-Garland underfired broilers could apply to other equipment.
- Steamers are somewhat of a niche market, so they would not be a suitable candidate to invest more deeply in at this time.

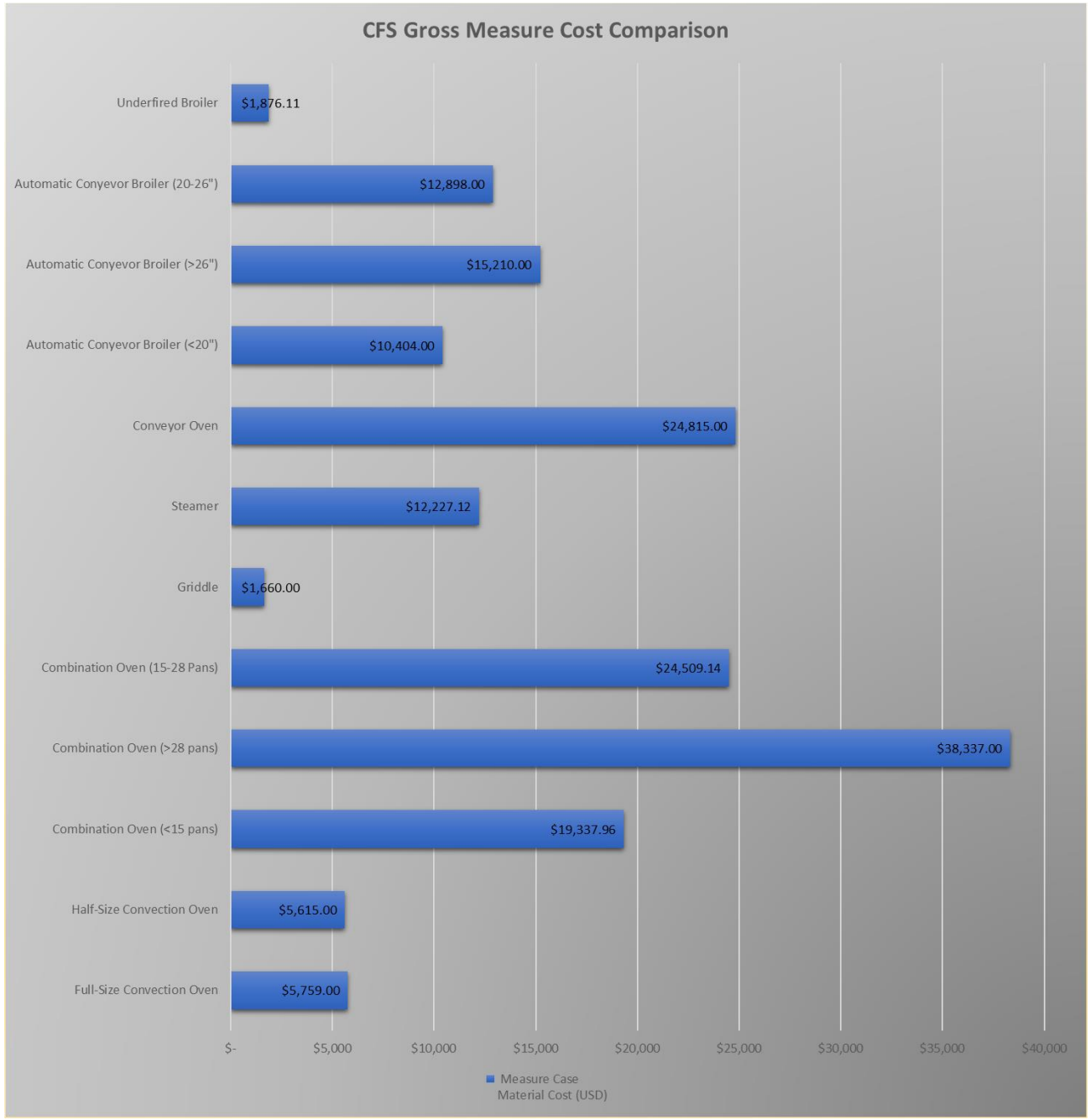
- Conveyor broilers only have two (2) manufacturers that make qualified products. However, there is some interest in seeing if more work could be done with specific chain restaurants to use conveyor broilers. A few other chain restaurants have investigated using conveyor broilers but have not decided to use them at this time. There has not been a lot of marketing or investment in conveyor broilers. Lastly, some conveyor broiler models have a catalytic converter that also makes the broiler more efficient by retaining more heat inside the broiler.

Measure Costs Comparison

The gross measure costs for each measure were taken from the most recent measure packages downloaded from the electronic technical reference manual (eTRM) (California Technical Forum, 2022).

Figure 6 shows the gross measure costs for different EE measures. These measure costs were considered when deciding which measures to select as high priority because one of the noted barriers is the first cost of EE equipment. The gross measure cost is the closest estimate of the first cost in a measure package. The study team wanted to select measures that had a range of first costs.

Figure 6: CFS Gross Measure Cost Comparison


CFS Gross Measure Cost Comparison
Underfired Broiler
$1,876.11
Automatic Conyevor Broiler (20-26")
$12,898.00
Automatic Conyevor Broiler (>26")
$15,210.00
Automatic Conyevor Broiler (<20")
$10,404.00
Conveyor Oven
$24,815.00
Steamer
$12,227.12
Griddle
$1,660.00
Combination Oven (15-28 Pans)
$24,509.14
Combination Oven (>28 pans)
$38,337.00
Combination Oven (<15 pans)
$19,337.96
Half-Size Convection Oven
$5,615.00
Full-Size Convection Oven
$5,759.00
$-
$5,000
$10,000
$15,000
$20,000
$25,000
$30,000
$35,000
$40,000
Measure Case Material Cost (USD)

High Priority Existing CFS Measures

The study team ultimately selected the following measures as high priority. This selection covers a range of TRC/TSBs, first costs, and traction in the market using yearly claims and net therm savings as a proxy.

1) Commercial Griddle (Measure Package SWFS004)
2) Underfired Broiler (Measure Package SWFS019)
3) Automatic Conveyor Broiler (Measure Package SWFS017)
4) Steam Tables (No Measure Package)

These measures were selected based upon SoCalGas utility representative feedback and each measures' TRC/TSB, gross measure cost, and traction in the market. Traction in the market was compared using the yearly net therms claimed. A higher overall net therms savings claim from 2017-2021 indicates more traction in the market. Table 6 shows a summary of the existing high priority EE CFS measures. Steam tables were not included in Table 6 because they do not have a measure package, so they don't have TRC/TSB values, therms savings, or gross measure cost.

Table 6: Summary of Existing High Priority Measures

Measure	Measure Package#	TRC	TSB	Net Therms Savings (2017-2021)	Gross Measure Cost
Commercial Griddle	SWFS004	1.59	$19,022	108,945	$1,660/Length-Ft
Underfired Broiler	SWFS019	2.30	$20,293	5,307	$1,876//Length-Ft
Automatic Conveyor Broiler	SWFS017	7.80	$523,754	119,802	$10,404 - $15,210/Each

Each measure is discussed in more detail in the sections below.

Commercial Gas Griddle

Griddles utilize flat cooking surfaces to maintain temperature uniformity. Recent advances in griddle technology have led to more uniform temperature distributions, upgraded controls, and increased production rates. Standard non-thermostatic griddles only offer control over different ranges of temperatures, typically high, medium, and low. The newer EE griddles offer advanced thermostatic controls across multiple cooking zones, offering customers a seamless experience as they cook multiple foods in their production line. The thermostatic controls allow the operator to set a specific cooking temperature, thus operators do not have to manually adjust the burners to maintain the desired cooking temperature. The more advanced controls can be a market barrier for the customers that desire high efficiency equipment without premium controls, as mentioned earlier as a nuance in the CFS industry. Figure 7 shows a Garland CG-60F Countertop Gas Griddle with Thermostatic Controls.

Figure 7: Garland CG-60F Countertop Gas Griddle with Thermostatic Controls (Plant Based Bros, 2022)

The griddle measure package SWFS004 was used to determine if there was an opportunity to revise the measure package to include a Tier I/Tier II approach so that a higher incentive could be offered for the highest efficiency gas-fired griddles on the California Energy Wise Instant Rebates Qualified Products List (QPL) (California Energy Wise, 2022). The energy savings, cost

savings, costs and TRCs were compared for the measure package[3] and the highest efficiency gas-only griddles on the QPL. The QPL has several griddles which have natural gas listed as the fuel-type but which use both gas and electricity. For the sake of simplicity, these gas and electric-fired griddles were not included in this Tier I/Tier II analysis, but they would need to be considered if a measure package revision were done. The highest efficiency gas-only griddles have an energy efficiency of 54% while the rest of the griddles have an efficiency of 38% - 47% according to the data from the QPL.

The input variables for the measure package are available on the California Energy Wise Instant Rebates Qualified Products List (California Energy Wise, 2022), which are:

1) Cooking efficiency
2) Idle Energy
3) Preheat Energy
4) Production Capacity

Additionally, the measure package documentation already has costs for a 3-foot, 54% efficient Griddle.

The measure package measure case variables are an average of the testing data of the many griddles on the QPL. The measure package cost is an average of three-foot griddles from three (3) different manufacturers. The measure package savings, costs, return on investment (ROI), and TRC values were compared to the values for the 54% efficient griddles. The results for both are shown in Table 7**Error! Reference source not found.**.

Table 7: Griddle Measure Package vs. 54% Efficient Griddle Comparison

	Therm Savings	Cost Savings	Gross Measure Cost	Incremental Measure Cost	ROI (Years)	TRC (Elec & gas)	TRC Gas only
Measure Package SWFS004	125.7	$126	$1,660	$449	13.2	1.59	2.42

[3] The measure package is based on an average of the equipment on the griddle QPL

54% Efficient Griddle	170.1	$170	$1,717	$506	10.1	1.83	2.89

The higher TRC For the 54% efficient unit indicates a Tier I/Tier II measure package revision could potentially support a higher incentive for the 54% efficient griddles, increasing market traction, and energy-efficient technology adoption. Additionally, many higher efficiency griddles have thermostatic controls that allow them to precisely control temperature and vary temperatures across multiple zones. There is also a need to do field studies to gather more information about how the thermostatic controls benefit foodservice owners and operators and then leverage that data to create marketing materials for high-efficiency griddles.

Commercial Underfired Broiler

The underfired broiler uses heavy-duty cooking grates above a radiant heating surface that food dripping falls onto to create the desired charbroiled characteristic flavor. According to another PG&E study (Pacific Gas and Electric, 2017) that studied energy savings for EE underfired broilers, adoption of EE broilers can have a significant impact on overall restaurant gas usage. These broilers are typically maintained at high operating temperatures, regardless of if they are being used for cooking food or not, which radiates a significant amount of heat into the surrounding kitchen environment. The primary reason customers use this equipment is to provide the signature charbroiled flavor, but this technology has been using the same outdated, inefficient designs the past 30 years (Pacific Gas and Electric, 2017). There is potential for energy savings by increasing adoption of more efficient broiler designs that maintain the signature charbroiling flavor. Figure 8 shows EE Garland GTXHP36 Countertop Underfired Broiler.

Figure 8: Highly Efficient Garland GTXHP36 Countertop Underfired Broiler (Webstaurant Store, Inc., 2022)

The Underfired Broiler measure package SWFS019 was used to determine if there was an opportunity to revise the measure package to include a Tier I/Tier II approach so that a higher incentive could be offered for the highest efficiency underfired broilers. The measure package uses the idle energy rate which is available on the California Energy Wise Instant Rebates QPL.

The measure package's measure case idle energy rate is an average of the testing data of many under-fired broilers on the QPL.

Cost data in the measure package was obtained for three (3) three-foot broiler models from the online price list of two (2) foodservice equipment vendors in 2018. Since the highest efficiency broilers came into the market after 2018, there was no available cost data for them in the measure package. Cost data was found online from two (2) sources (Kitchen Restock, 2022) (Webstaurant Store, Inc., 2022) for one (1) of the highest efficiency broilers on the qualified products list (a 2.5-foot model). The gross measure cost and incremental measure cost (IMC) per foot of broiler can be seen in Table 8 below.

Table 8: Under-Fired Broilers vs. Highest Efficiency Broiler Comparisons

	Therm Savings	Cost Savings	Gross Measure Cost	Incremental Measure Cost	ROI (Years)	TRC
Measure Package SWFS019	217.8	$218	$1,876	$817	8.61	2.3
Highest Efficiency Broiler	416.4	$416	$6,525	$5,466	15.67	0.66

The energy performance of the highest efficiency broilers is significantly better than the other broilers on the qualifying products list. However, the measure cost is about three (3) times that of the other broilers. This cost increases the ROI and decreases the TRC. Since the highest efficiency broilers are new on the market, the costs may decrease over time, and it is also possible that the average cost of these broilers changes significantly when also considering the cost of longer broilers (for example a 3.5-foot broiler) which could lead to the potential for a Tier I/Tier II underfired broiler measure package.

Even if a Tier I/Tier II measure package cannot be supported, there is still considerable scope for improvement and market potential for high-efficiency broilers.

Commercial Automatic Conveyor Broiler

The automatic conveyor broiler offers the added convenience of the automated cooking process through the cooking cavity ideal for large restaurant chains that require high production capacity and consistent food quality. They cook using direct and indirect open flames providing a signature flame-broiled flavor typically used for burgers, pizzas, or other specialty meats. There is a large potential to save energy using EE automatic conveyor broilers that have comparable production capacities and reduce the heat load into the kitchen. Automatic conveyor broilers use more complicated controls that can act as a market barrier. Figure 9 shows a Nieco Automatic Conveyor Broiler.

Figure 9: Nieco Automatic Conveyor Broiler MPB84 (Tamirson, 2022)

Conveyor broilers have the highest TRC of any CFS measure and have a low number of installations from 2017-2021. The gross cost of a conveyor broiler is much higher than a griddle ($10k - $15k for conveyor broiler vs $1600 for griddles), but it is lower than combination ovens ($15k - $32k) which have many more installations from 2017-2021 (see

Table 5) which indicates that for the right piece of equipment, restaurants are willing to invest more money upfront. SoCalGas utility representatives indicated that customers who do not have conveyor broilers use underfired broilers or griddles. There is an opportunity to investigate the relative energy usage per pound of product from a griddle and conveyor broiler to see which one consumes less energy. SoCalGas SMEs also indicated that conveyer broilers are the only piece of foodservice equipment with a catalytic converter which is essential considering the tightening regulatory environment on gas-consuming equipment in California.

Commercial Steam Tables

Steam tables are used in commercial food service facilities to maintain food temperatures at prescribed safe levels prior to serving. Steam tables are commonly found where food is served buffet style. Food is kept in individual pans of varying sizes which are then placed in the steam tables to maintain temperature. In most cases, the steam table heats up water (known as a wet-bath, wet-well, or sealed steam table) and the resultant steam provides uniform heat to all the pans. Another, more efficient configuration is to use insulated wells for each pan where each well has its own burner and burner control (known as open or dry-well). Dry-well steam tables can be used without water or with spillage pans that are filled with water.

Based on a study completed for SoCalGas and SDG&E, steam tables show great potential to reduce energy consumption (Frontier Energy, 2020). However, no measures with "steam table" have been found in the CEDARS data from 2019-2021 which indicates that this is not a measure that any IOU is currently incentivizing. While electric steam tables are more popular in the rest of the country, Southern California prefers gas fired steam tables. This measure shows promise based on this ET study that demonstrated up to 70% energy savings and that reasonable paybacks can be met. The ET study also found that the EE units do not save as much energy if the steam tables pans are not covered. Therefore, the application of this technology should be properly evaluated before considering the upgrade to the more energy efficient unit.

The ET study was limited in scope and only looked at five (5) steam table models and three (3) sites so the results may not be representative across the entire market. The study concluded through market analysis that customers may be willing to replace their existing inefficient units with more efficient units if they saved more than $300/year in energy costs. Similarly, a survey of gas fired steam tables showed that more than 70% of the units operating in the market are not efficient. Additionally, possible market barriers considered were the effects of the COVID-19 pandemic outbreak causing the closing of hotels, restaurants, cafeterias, and other places that commonly use steam tables. Figure 10 shows a Commercial Dry-Well Natural Gas Steam Table.

Figure 10: Commercial Dry-Well Natural Gas Steam Table (Webstaurant Store, 2022)

Recommendations for Energy Efficient Steam Tables

Since this measure does not have an existing measure package, targeted research was performed to provide parameters for measure package development which is essential to increase adoption of this measure.

Base Case Description

Based on previous studies conducted on this technology, it was proposed that the most prevalent steam tables are the wet well type which use a single, large, uninsulated heated water bath over which the pans are placed.

Measure Case Description

Enhancements in steam table technologies have resulted in separate insulated dry wells, one for each pan, with their own gas control. Even more advances have resulted in thermostatically controlled valves to maintain preset temperatures within pans providing further control of burners.

Code Requirements

The measure is not currently affected by any code requirements.

Measure Package Needs

A measure package was created for steam tables based upon the ET study for SoCalGas and SDG&E. The CPUC provided the following comments on the measure package:

1) **Limited data used to develop savings estimates:** Not enough data was collected to establish the energy savings between wet well steam tables and dry well steam tables which is the more compelling energy savings value. This is demonstrated by the significant variation in observed baseline conditions and variation in energy savings.
2) **Uncertainty and variability in savings results:** Calculated energy use and savings results shown in the ET report are highly variable. Additional market data analysis and field testing for more specific configuration variations would be required.
3) **A unique and limiting measure definition:** This measure differs from other typical deemed measures because the baseline and measure equipment are quite different configurations: The inefficient baseline is a wet well steam table which may be custom built while the efficient measure is an off-the-shelf dry well steam table.
4) **An ISP study is needed:** Steam tables are not governed by codes and standards or ENERGY STAR, do not have existing performance testing procedures or efficiency ratings, and are not supported by a list of certified high-efficiency equipment like many other food service measures. An industry standard practice (ISP) study for wet well and dry well units would be needed to establish the baseline practices, manufacturer market information, and standard and high-efficiency threshold values for dry well steam tables.
5) **No testing protocol:** A key goal for the study was to create a performance testing protocol but the study was unsuccessful due to the lack of thermostatic control (units cannot be set to a specific temperature), and variation in actual configuration and operation. If a certified testing protocol could be established, measures could be placed on a qualified product list and incentivized as has been done for other food service measures.
6) **Hours of use should be specified by building type:** The hours of use for savings is only estimated at an average for the sector (Com) but operation should vary by building type.

Based upon the comments on the measure package, the following direction was provided by the CPUC to strengthen the measure package.

1) **Conduct Market Research to Determine Key Operating Parameters:** A study must be completed to determine key participant operating parameters supporting energy savings calculations, equipment characterization and to also verify sourced-parameters and assumptions from the current measure package.
2) **Conduct Market Research to Determine Market Share Statistics**: A study must be completed to determine market share for various natural gas steam table configurations.
3) **Optional-Conduct Additional Field Monitoring**: If the utility desires to retain the Accelerated Replacement (AR) offering, utility must collect field data ensuring representative data collection of replaced custom wet well tables, manufactured wet well tables, and manufactured dry well tables, while ensuring representation of manufactured market share approaching 50% of sales by segment while metering all replaced custom and manufactured wet well tables.
4) **Optional – Develop Testing Protocols and Conduct Laboratory Tests:** If the utility desires to use a laboratory approach to estimate normal replacement (NR)/new construction (NC) savings, the utility must develop testing protocols for steam tables. The utility should ensure tests of both manufactured wet well and dry well tables, while ensuring representation of market share approaching 50% of sales by segment, and to best reflect real-word behaviors, such as use of pan lids. A qualified product list could also be developed.
5) **Establish Industry Standard Practice and Qualifying Steam Table Attributes/Models:** The utility must combine field monitoring results, laboratory testing and market results and then examine patterns of steam table sales and efficiency by segment, with the vision being to assess qualifying characteristics/models and high-volume sales (i.e., Industry Standard Practice - ISP) characteristics/models, while ensuring comparability among those two groups, as needed for activities related to savings calculations.
6) **Revise Savings Calculations and Submit Measure Package for Review:** Once the above items have been addressed, the utility must revise the measure package and submit it for another review.

The study team incorporated additional questions about steam tables into a later task where restaurant owners/managers were interviewed to help determine if the items needed to revise the measure package are worth doing. The overall recommendations for steam tables based upon the CPUC feedback provided here and the customer feedback are summarized in the “Results & Discussion” section.

Market Potential Estimates of Selected EE CFS Measures

Once the high priority EE CFS measures were selected, a market potential evaluation was done for each measure.

Market Size

The market potential calculations were done using the average number of appliances in California. The number of appliances was determined using either the total number of restaurants or total restaurant floor stock [kft^2].

Number of Restaurants

The total number of commercial foodservice facilities is 93,300 based upon a CEC Study (California Energy Commission, 2021). This number includes kitchens in building types other than restaurants such as hotels, schools, etc. The total number of restaurants in California were estimated to be 76,201 in the year 2018 (National Restaurant Association, 2019). This was the most recent data available, and it is assumed that both numbers account for the COVID-19 pandemic related drop and post-pandemic rise.

Total Floor Stock

The total floor stock of restaurants in California was given in the California End-Use Survey as 148,800 ksqft (Itron, KEMA, ADM Associates, James J. Hirsch & Associates, 2006). The total restaurant floor stock only includes buildings for which the primary use of the building is for a restaurant, and it does not include the areas used for food preparation and dining in other building types such as hotels or schools. The market potential needs to include those other building types, so the total commercial foodservice floor stock was calculated.

First, the total floor stock of restaurants was divided by the total number of restaurants to get the average size of one (1) restaurant which was 1,953ft^2.

$$\frac{148{,}000{,}000\ [\text{ft}^2]}{76{,}200\ \text{restaurants}} = 1{,}953\ \text{ft}^2/_{\text{restaurant}}$$

The average area of a single restaurant includes both kitchen and dining area, and the total floor stock of restaurants in the CEUS includes both kitchen and dining areas. However, the average floor stock of other building types in CEUS includes many

other spaces besides kitchen and dining areas. For example the total floor stock in a hotel includes guest rooms, hallways, and the lobby. In order to calculate the total floor stock of commercial foodservice in California, the average restaurant area was multiplied by the total number of foodservice facilities which is 182,192 kft^2.

$$1{,}953\left[\frac{ft^2}{restaurant}\right] * 93{,}300\ Foodservice\ Facilities = 182{,}192{,}126\ ft^2$$

This floor stock (182,192 kft^2) represents the total commercial foodservice floor stock in California (including only kitchen and dining areas) in restaurants and other building types[4].

Market Potential

Commercial Griddle

Market Size

The PG Study gives the technology group density for gas-fired griddles in different building types. Technology group density is given in units of griddle/ 1000 ft^2. The PG Study uses the source "California Energy Demand 2019" from the CEC for the total floor stock on each building type. However, the PG Study indicates on page 47 that this document was provided to the PG Study team via e-mail (California Public Utilities Commission, 2021). In lieu of that information, the total commercial foodservice floor stock was used. Since the total commercial foodservice floor stock includes only kitchen and dining areas and a restaurant includes only kitchen and dining areas, the technology group density for restaurants from the PG study was used.

$$182{,}192.126\ kft^2 * 0.262361251\ \frac{Griddle}{1000ft^2, restaurant} = 47{,}800\ Griddles$$

The total market size for griddles is estimated to be 47,800 griddles.

[4] Restaurants include some other areas such as bathrooms, storage closets, etc., but these were considered to be negligible on a statewide scale.

Market Potential

The market potential for griddles was calculated from the 2021 Potential and Goals Study (California Public Utilities Commission, 2021), 2021 PG Measure Results Database. In this database there is an "Incremental Achievable Potential tab." On this tab 'Scenario 2a: TRC Reference' and 'Com | ENERGY STAR Griddle – Gas' were selected. Then, the total potential savings were summed for all years (2022-2032) to get total Market Potential from 2022 - 2032. The total market potential was divided by 11 years to get the average market potential per year from 2022 - 2032. This came out to be 81,989 therms/year.

Market Penetration

The market penetration is determined by dividing the market potential by the market size. In this study, the 2021 PG study market penetration was compared to the historical market penetration from the CEDARS data.

The 2021 PG Study market penetration was determined using Equation 1.

Equation 1: Market Penetration Based on PG Study Data

$$MarketPenetration_{PGStudy} = \frac{MarketPotential_{PGStudy,Yearly,Avg}\ [therms]}{MarketSize[Appliances] * Savings\ [\frac{therms}{appliance}]}$$

Where:

$MarketPenetration_{PGStudy}$ is the average yearly market penetration based on the PG study market potential

$MarketPotential_{PGStudy,Yearly,Avg}$ is the average yearly market potential from the PG Study in therms

Market Size is the total number of appliances in California

Savings is the therm savings per appliance

Therms savings were obtained from the measure package SWFS004. The normalizing unit was Len-Ft. The average griddle width used in the measure package was 3 feet, and therefore the therms savings was multiplied by 3 feet, to get the total therms savings of 378 therms/year-griddle.

The resulting market penetration value from the PG Study data was 0.4538%.

The historical market penetration was calculated using Equation 2.

Equation 2: Historical Market Penetration

$$MarketPenetration_{Historical} = \frac{Installations_{Avg,Yearly}\,[appliances]}{MarketSize[appliances]}$$

Where

$MarketPenetration_{Historical}$ is the market penetration based upon the historical claims data from CEDARS from 2017-2021

$Installations_{Avg,Yearly}$ is the average number of appliances installed from 2017-2021 per year from the CEDARS data

The historical market penetration value was 0.1598% which is lower than the PG Study value.

Commercial Underfired Broiler

Market Size

Since the 2021 PG Study did not include the underfired broiler as a part of the study, a different approach was used to find the market size. The values of the saturation rate and ownership for underfired broilers are found to be 0.16 and 1.2 respectively from a DOE study (U.S. Department of Energy, 2015). Saturation rate of an appliance refers to the percentage of restaurants that use the appliance. Ownership refers to the average number of appliances per establishment. The market size is the product of the number of establishments, the saturation rate and ownership factor for the underfired broiler. In the DOE study, saturation and ownership values were applied to commercial and institutional establishments. Therefore, the total number of foodservice facilities (which includes institutional facilities) was used to determine the total market size.

16% (saturation rate) * 1.2 (ownership rate) * 93,300 (commercial foodservice facilities) = 17,914 underfired broilers

The total market size for underfired broilers is estimated to be 17,914 underfired broilers in California.

Market Penetration

Since the PG Study did not include underfired broilers, the PG study market penetration for automatic conveyor broilers was used as a proxy for the PG study market penetration for underfired broilers. The PG study market penetration for automatic conveyor broilers is 2.33%. The historical market penetration was calculated using Equation 2. The historical market penetration came out to be 0.0223% which is less than the PG Study market penetration.

Market Potential

The market potential is the product of the market size, market penetration, and therms/appliance. The therms savings were found in measure package SWFS019 to be 218 therms/len-ft and the average width of the underfired broiler is 3 ft. Multiplying with a factor of 3, the total therms savings was calculated to be 654 therms/underfired broiler. The product of the market size, market penetration and total therms savings gave the market potential value, which was 272,977 therms per year.

$$17{,}914\ underfired\ broilers * \ 2.33\% * 654\ \left[\frac{therms}{underfired\ broiler}\right] = 272{,}977\ therms$$

Commercial Automatic Conveyor Broiler

Market Size

The technology group density from the PG Study for restaurants is given in units of conveyor broiler/ 1000 ft^2. The total commercial foodservice floor stock was multiplied with the technology group density to get the total market size for conveyor broilers.

$$182{,}192.126\ kft^2 * \ 0.009586276\ \frac{Griddle}{1000ft^2, restaurant} = 1{,}747\ automatic\ conveyor\ broilers$$

The total market size for griddles is estimated to be 1,747 automatic conveyor broilers.

Market Potential

The market potential for automatic conveyor broilers was calculated from the 2021 Potential and Goals Study (California Public Utilities Commission, 2021), 2021 PG Measure Results Database. In this database there is an "Incremental Achievable Potential tab." On this tab 'Scenario 2a: TRC Reference' and 'Com | ENERGY STAR Conveyor Broiler - Gas' were selected. Then, the total potential savings were summed for all years (2022-32) to get total Market Potential from 2022 - 2032. The total market potential was divided by 11 years to get the average market potential per year. This came out to be 78,500 therms/year.

Market Penetration

The 2021 PG Study market penetration was determined using Equation 1.

Therms savings were obtained from the measure package SWFS017 and were 1,930 therms/broiler.

The resulting market penetration value from the PG Study data was 2.33%.

The historical market penetration was calculated using Equation 2. The historical market penetration value was 0.9445% which is lower than the PG Study value.

Steam Tables

Market Size

The only available information for the steam table market size is from the aforementioned ET steam table report (Frontier Energy, 2020). This study found that 25% of restaurants surveyed had at least one (1) gas-fired steam table and, of those, 30% of respondents already had dry-well steam tables[5]. The total number of restaurants in California were estimated to be 76,201 in the year 2018 (National Restaurant Association, 2019). Multiplying 76,201 restaurants by the 25% which have at least (1) steam table and the 70% which have an inefficient gas-fired steam table yields 13,335 steam tables in California.

Market Potential

There is no historical market potential data nor is there data for steam tables from the PG Study. So, the anticipated market penetration from the ET study of 10% is used to determine the market potential (Frontier Energy, 2020). The average therms savings from the same ET study were 649 therms per steam table per year. Assuming these values, the market potential is calculated by finding the product of the market size, market penetration and the therms savings, which is 865,442 therms.

Market Potential Range

The PG Study penetration rates and the historical penetration rates are very low, but the ET steam table report estimated a market penetration of 10%. Assuming that this market penetration rate is reasonable for an EE CFS measure, the study team calculated market potentials at 5% and 10% penetration to get a wider range of market potential as shown in Table 9. These

[5] This study only surveyed restaurants and did not survey institutional facilities.

market penetration rates are theoretical and may not be realized due to the restaurant owners' preference for 1-2 year ROIs, but it gives an understanding of the technical potential of these EE CFS measures.

Table 9: Technologies with 5% and 10% penetration rates

Technologies	Market Size (Number of Units)	Market Penetration	Therms/unit	Market Potential (Therms/year)
Griddle	47,800	5%	378	903,420
Underfired Broiler	17,914		654	585,788
Conveyer Broiler	1,747		1,930	168,586
Steam Table	13,335		649	432,721
Griddle	47,800	10%	378	1,806,840
Underfired Broiler	17,914		654	1,171,576
Conveyer Broiler	1,747		1,930	337,171
Steam Table**Error! Bookmark not defined.**	13,335		649	865,442

The range of market potential values calculated are shown below in Table 10. The low market potential value is from the preceding sections (PG Study or Table 9 at 5% market penetration), and the high market potential is from the values in Table 9 at 10% market penetration.

Table 10: Market Potential Ranges

Technology	Low Market Penetration Source	Low Market Penetration Value	Low Market Potential [Therms/year]	High Market Potential @ 10% Penetration [Therms/year]
Griddle	PG Study	0.2246%	81,989	1,806,840

Underfired Broiler[6]	PG Study	0.0273%	272,977	1,171,576
Conveyer Broiler	PG Study	1.1526%	78,500	337,171
Steam Table[7]	Table 9	5%	432,721	865,442

Subject Matter Expert Interviews

After the high priority EE CFS measures were selected, Subject Matter Experts (SMEs) were interviewed about barriers to installation and operation of EE CFS equipment in California. Interviews also gathered information about how CFS equipment is distributed. SMEs included (2) utility reps, (4) manufacturers, (1) distributor, and (3) technical experts. The interviews focused specifically on addressing the following:

- Market availability of emerging CFS technologies
- Ease of adoption/use of identified emerging CFS technologies
- Drivers and market barriers specifically related to 1) installing EE CFS equipment and 2) using EE equipment
- Installation and commissioning costs

Target Audience

Commercial foodservice (CFS) SMEs were interviewed across multiple categories, including a distributor (DIST), manufacturers (MFG), technical experts (TE), and Utility Representatives (UR), to characterize the gas EE CFS market for the selected measures. The distributor and manufacturers were found via the California Foodservice Instant Rebates Program equipment contact list, as the identified high-priority technologies are on the qualifying product list for that program. Technical experts were surveyed via previous professional relationships. Also, Statewide Midstream Foodservice Program utility representatives were included to understand the midstream EE program and how it interacts with the CFS market.

[6] Underfired broiler uses the PG Study market penetration from the automatic conveyor broiler
[7] Steam tables are not included in PG Study and have no historical participation in CEDARS data

Survey Questionnaire

The survey questionnaire was divided into two categories: technology adoption drivers and technology adoption barriers. The questions included the perspective of the SME, i.e., manufacturer, contractor, distributor, and end-user. The questions used for the survey are shown below.

SME Survey Questions

Technology Adoption Drivers

1. How much of a driver is commissary kitchen services?
2. How much of a driver is consolidating kitchen operations to offer additional products?
3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?
4. How much of a driver is the compliance with environmental/worker safety regulations?
5. How much of a driver are easy installations, or plug-n-play type situations?
6. How much of a driver are new or advanced features for the end-user?
7. How much of a driver is the recyclability of emerging foodservice equipment?
8. How much of a driver is local manufacturing or production to the end-user?
9. How much of a driver is improved performance for the end-user?
10. How much of a driver is the customer's incentive to save on energy operation?
11. How much of a driver is the customer's willingness to pay a premium for a better product?
12. How much of a driver is government support for technology uptake?
13. How much of a driver is independent verification of performance?
14. How much of a driver is a shorter-to-market cycle when entering the market?
15. How much of a driver is labor savings from using new equipment, such as self-cleaning ovens?
16. How much of a driver for steam tables is to maintain food at the ideal temperatures?
17. How much of a driver are the added advantages of dry-well vs. wet-bath steam tables?

Technology Adoption Barriers

18. How much of a barrier is the increased up-front cost?
19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?
20. How much of a barrier is the lack of readily available energy-efficient foodservice equipment?
21. How much of a barrier are current supply-chain issues?
22. How much of a barrier are adverse gas regulatory environments?
23. How much of a barrier is the lack of awareness?
24. How much of a barrier is the misconception that efficiency is achieved at the cost of performance?
25. How much of a barrier is the uncertainty in stated performance?
26. How much of a barrier is the considerable variation in unit pricing?
27. How much of a barrier is higher lifecycle costs to the end user?
28. How much of a barrier is the end user's lack of awareness of GHG savings?
29. How much of a barrier is the uncertainty of future foodservice codes/standards?
30. How much of a barrier is the lack of employee/operator training?
31. How much of a barrier is the lack of maintenance personnel?
32. How much of a barrier is improper maintenance of advanced designs? i.e., Low-NOx burners.
33. How much of a barrier is added maintenance with a conveyor broiler vs. an underfired broiler?
34. How much of a barrier is the improper operation of multi-functional equipment? i.e., combi ovens.

SME Responses – All Respondents

The survey responses were recorded using a 5-Point Likert Scaling system to maintain consistency and provide quantifiable answers for statistical analysis. The scaling system is based on the importance of the specific market penetration driver or barrier being questioned. The response average, standard deviation (SD), and coefficient of variations (CV) are included for later analysis. The SD shows how dispersed the responses with respect to the average response. The CV is also included to show the ratio between the SD and average. This helps measure the variance, i.e., CV of (0.5) means the SD is half of the average showing high variance, and CV close to (0.1) means the SD is much smaller than the average showing low variance. Lower CV values indicate the respondents are in most agreement, and the largest CV values show the most disagreement. The dash (-) indicates no response to that question, as the respondent opted out for those specific questions. Lastly, the non-integer values are used for responses given for two numbers, i.e., (3.5) is given for a response with both (3) and (4). Table 11 and

Table 12 summarize the technology adoption drivers and barriers, respectively based on SME responses for each question.

Table 11: Market Penetration Drivers – All Respondents

Market Penetration Drivers																	
No.	Type	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17
1	DIST	4	5	2	4	4	3	2	4	4	3	4.5	3.5	3	3.5	4.5	4	4.5
2	MFG	2.5	5	2	5	3	3	2	4	5	5	3	2	5	4.5	2	2	4
3	MFG	2	4	2	3	3	3	2	3	4	4	3	3	3	3	5	3	4
4	MFG	2	4	2	3	4	4	1	3	4.5	3	5	4	4	4	5	-	-
5	MFG	1	3	1.5	1	3	3	2	5	4	3	3	4	5	3	3	5	-
6	TE	3	5	3.5	4.5	4	5	2	2	5	4.5	4	4	4	4	5	5	5
7	TE	3	4	3	5	4	3	3	3	4.5	4	3	3.5	3.5	2	4	3	4
8	TE	2.5	5	5	2	5	5	4	4	5	5	3.5	5	5	4	5	-	-
9	UR	3	4	3	3	5	5	1	-	5	4	4	3.5	4.5	3	5	-	-
10	UR	4	4	1.5	3	5	4	2.5	3	4	4.5	4	5	4	5	5	-	4
Average:		2.7	4.3	2.6	3.4	4.0	3.8	2.2	3.4	4.5	4.0	3.7	3.8	4.1	3.6	4.4	3.7	4.3
SD:		0.9	0.6	1.0	1.2	0.8	0.9	0.8	0.8	0.5	0.7	0.7	0.8	0.7	0.8	1.0	1.1	0.4
CV:		0.32	0.15	0.41	0.37	0.19	0.23	0.39	0.24	0.10	0.19	0.18	0.23	0.18	0.23	0.23	0.30	0.09

Table 12: Market Penetration Barriers – All Respondents

Market Penetration Barriers																		
No.	Type	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34
1	DIST	3	4	4	5	4	4	2	3	5	3	5	4	5	5	5	4	4
2	MFG	5	2	4	4	5	5	3	5	2	5	2	5	2	2	2	5	2
3	MFG	5	2	2	2	3	2	1	4	3	4	2	3	2	3	4	2	2
4	MFG	4.5	4.5	4	5	2	5	5	5	2	4	2	3	5	4	4	-	-
5	MFG	5	5	5	5	5	5	5	2	3	3	4	3	4	5	3	4	5
6	TE	5	4	1	5	5	4	4	4.5	3	1	2	5	1	1.5	2	4	3
7	TE	5	4	5	5	4	5	4	3.5	5	4	2	2	5	4	4	5	4
8	TE	5	4	4	5	2	5	4	4.5	2.5	2	2	2	3.5	5	-	-	2
9	UR	4	2.5	2	5	2.5	4	-	4	2	5	5	2	2	-	-	-	-
10	UR	5	4	5	5	4	3	2	4	2	3	2	2	3.5	3.5	4	-	-
Average:		4.7	3.6	3.6	4.6	3.7	4.2	3.3	4.0	3.0	3.4	2.8	3.1	3.3	3.7	3.5	4.0	3.6
SD:		0.6	1.0	1.4	0.9	1.1	1.0	1.3	0.9	1.1	1.2	1.3	1.1	1.4	1.2	1.0	1.0	1.1
CV:		0.14	0.28	0.38	0.20	0.31	0.23	0.40	0.22	0.38	0.35	0.45	0.37	0.42	0.33	0.29	0.25	0.31

SME Responses – by Interviewee Type

The SME responses were further separated by interviewee type in the following two categories: 1. Distributors/Manufacturers (DIST/MFG) and 2. Technical Experts/Utility Reps (TE/UR). The two (2) categories represent different segments of the commercial foodservice market. The distributors and manufacturers represent the midstream and upstream segments, respectively. The technical experts and utility representatives influence and manage rebate and incentive programs. They offer a different perspective compared to the distributors and manufacturers. Also, they are assumed to not be biased towards any specific technologies, while the distributors and manufacturers may be biased towards their own products. Table 13 and Table 14 summarize the market penetration drivers for the two groups and

Table 15 and Table 16 summarize the market penetration barrier responses for the two groups.

Table 13: Market Penetration Drivers – Distributor/Manufacturer Respondents

Market Penetration Drivers																	
No.	**Type**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**
1	DIST	4	5	2	4	4	3	2	4	4	3	4.5	3.5	3	3.5	4.5	4	4.5
2	MFG	2.5	5	2	5	3	3	2	4	5	5	3	2	5	4.5	2	2	4
3	MFG	2	4	2	3	3	3	2	3	4	4	3	3	3	3	5	3	4
4	MFG	2	4	2	3	4	4	1	3	4.5	3	5	4	4	4	5	-	-
5	MFG	1	3	1.5	1	3	3	2	5	4	3	3	4	5	3	3	5	-
Average:		2.30	4.20	1.90	3.20	3.40	3.20	1.80	3.80	4.30	3.60	3.70	3.30	4.00	3.60	3.90	3.50	4.20
SD:		0.98	0.75	0.20	1.33	0.49	0.40	0.40	0.75	0.40	0.80	0.87	0.75	0.89	0.58	1.20	1.12	0.24
CV:		0.426	0.178	0.105	0.415	0.144	0.125	0.222	0.197	0.093	0.222	0.236	0.227	0.224	0.162	0.308	0.319	0.056

Table 14: Market Penetration Drivers – Utility Reps/Technical Experts Respondents

Market Penetration Drivers																	
No.	**Type**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**
6	TE	3	5	3.5	4.5	4	5	2	2	5	4.5	4	4	4	4	5	5	5
7	TE	3	4	3	5	4	3	3	3	4.5	4	3	3.5	3.5	2	4	3	4
8	TE	2.5	5	5	2	5	5	4	4	5	5	3.5	5	5	4	5	-	-
9	UR	3	4	3	3	5	5	1	-	5	4	4	3.5	4.5	3	5	-	-
10	UR	4	4	1.5	3	5	4	2.5	3	4	4.5	4	5	4	5	5	-	4
Average:		3.10	4.40	3.20	3.50	4.60	4.40	2.50	3.00	4.70	4.40	3.70	4.20	4.20	3.60	4.80	4.00	4.40
SD:		0.49	0.49	1.12	1.10	0.49	0.80	1.00	0.71	0.40	0.37	0.40	0.68	0.51	1.02	0.40	1.00	0.47
CV:		0.158	0.111	0.351	0.313	0.106	0.182	0.400	0.236	0.085	0.085	0.108	0.161	0.121	0.283	0.083	0.250	0.107

Table 15: Market Penetration Barriers – Distributor/Manufacturer Respondents

Market Penetration Barriers																	
No.	Type	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34
1	DIST	3	4	4	5	4	4	2	3	5	3	5	4	5	5	5	4	4
2	MFG	5	2	4	4	5	5	3	5	2	5	2	5	2	2	2	5	2
3	MFG	5	2	2	2	3	2	1	4	3	4	2	3	2	3	4	2	2
4	MFG	4.5	4.5	4	5	2	5	5	5	2	4	2	3	5	4	4	-	-
5	MFG	5	5	5	5	5	5	5	2	3	3	4	3	4	5	3	4	5
Average:		4.50	3.50	3.80	4.20	3.80	4.20	3.20	3.80	3.00	3.80	3.00	3.60	3.60	3.80	3.60	3.75	3.50
SD:		0.77	1.26	0.98	1.17	1.17	1.17	1.60	1.17	1.10	0.75	1.26	0.80	1.36	1.17	1.02	1.09	1.30
CV:		0.172	0.361	0.258	0.278	0.307	0.278	0.500	0.307	0.365	0.197	0.422	0.222	0.377	0.307	0.283	0.291	0.371

Table 16: Market Penetration Barriers – Utility Reps/Technical Experts Respondents

Market Penetration Barriers																	
No.	Type	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34
6	TE	5	4	1	5	5	4	4	4.5	3	1	2	5	1	1.5	2	4	3
7	TE	5	4	5	5	4	5	4	3.5	5	4	2	2	5	4	4	5	4
8	TE	5	4	4	5	2	5	4	4.5	2.5	2	2	2	3.5	5	-	-	2
9	UR	4	2.5	2	5	2.5	4	-	4	2	5	5	2	2	-	-	-	-
10	UR	5	4	5	5	4	3	2	4	2	3	2	2	3.5	3.5	4	-	-
Average:		4.80	3.70	3.40	5.00	3.50	4.20	3.50	4.10	2.90	3.00	2.60	2.60	3.00	3.50	3.33	4.50	3.70
SD:		0.40	0.60	1.62	0.00	1.10	0.75	0.87	0.37	1.11	1.41	1.20	1.20	1.38	1.27	0.94	0.50	0.82
CV:		0.083	0.162	0.478	0.000	0.313	0.178	0.247	0.091	0.384	0.471	0.462	0.462	0.459	0.364	0.283	0.111	0.221

SME Response Discussion

The below sections provide a discussion of the results in Tables 11 – 16. In the discussion below, a strong driver had a score of 4.0 or higher and a strong barrier had a score of 4.0 or higher. Where there was disagreement between the two groups (manufacturer/distributor and technical expert/utility rep) it was noted in each discussion point.

Market Availability of EE CFS Technologies

The manufacturers interviewed for this study offer several existing, high-priority gas technologies found in the California Foodservice Instant Rebates Qualifying Products List (QPL).

Several manufacturers offer high-efficiency gas griddles that are single zone. They target customers, generally quick-serve restaurants (QSR), that implement multiple single-zone griddles for redundancy instead of single multizone griddles. Thus, reliability is crucial in these applications where griddles are used as the "work-horse" of the kitchen. Also, one respondent indicated that the single-zone griddles typically have hot and cold spots that operators can utilize as a multizone griddle. Thus, there is high availability for these griddles and customers are willing to invest in multiple units for redundancy to prevent a possible downtime for the business. There were also manufacturers interviewed which make multizone griddles. One such manufacturer stated that most of their customers are fine-dining chefs that prefer high-grade equipment, so they have high availability of the high-end multizone griddles. The double-side multizone griddles are typically utilized by large chains, such as McDonald's, that custom orders for specific applications. In summary, the single zone and multizone griddles are generally readily available and have shorter lead times than the double-sided multi-zone griddles which are made-to-order and have longer lead times.

Two (2) underfired broiler manufacturers indicated that their high-efficiency underfired broilers are market available. Another manufacturer indicated the highest efficiency underfired broilers are relatively new to the market, with only one (1) model readily available, and the other larger models being "made to order."

Automatic conveyor broilers are "made to order," allowing customers to specify custom configurations for specific applications. Several respondents indicated that conveyor broilers are typically used for high-volume production only for specific applications, such as burgers. In contrast, underfired broilers are preferred for controlling finishing food quality and presentation factor.

Supply Chain

- Lack of readily available supply is a barrier to manufacturers and distributors

  The market availability of emerging energy-efficient foodservice equipment was addressed via question 20 (How much of a barrier is the lack of readily available energy-efficient foodservice equipment?) to understand the supply issues. The overall survey results show noticeable variation for question 20 with a CV of 0.4 regarding the lack of readily available supply, as a few respondents scored this very low. Respondent #6, scored this low and stated that suppliers could meet the demand for high-efficiency equipment if necessary. However, Respondent #5 scored this high and indicated that the suppliers focus on stocking minimum efficiency products to meet the bulk sales, which is considered a barrier to EE equipment sales. When question 20 was broken down by distributors/manufacturers and technical experts/utility reps the data shows that the distributors and manufacturers think this is more of a barrier than the technical experts and utility reps. The distributors and manufacturers average score was 3.8 with a CV of 0.26 while the technical experts/utility reps gave it an average score of 3.4 with a CV of 0.16.

- Current supply chain issues are a barrier

  There is a strong agreement for question 21 with a CV of 0.2 regarding the current supply chain issues as a market barrier. Only Respondent #2 scored this low, stating that labor shortages are causing current supply-chain issues that are not much of a barrier, explaining that large chains have the leverage to find workarounds to the supply chain issues by working directly with the manufacturers. Several respondents confirmed that supply-chain issues are causing prolonged lead times for customers, which acts as a barrier for all foodservice products. Also, some respondents indicated that large chains have the advantage of working directly with foodservice equipment manufacturers allowing for reduced lead times.

- Local manufacturing/production and shorter-to-market cycle are not strong drivers

  Question 8 (How much of a driver is local manufacturing or production to the end-user?) accounted for the need for local manufacturing to reduce supply-chain issues. Most respondents were neutral, stating that customers weigh the upfront cost vs. lead time to decide depending on their business circumstances. Question 14 (How much of a driver is a shorter-to-market cycle when entering the market?) was included to understand whether a shorter-to-market cycle benefits EE CFS technologies by increasing EE technologies' market availability. Respondent #10 indicated that entering the market sooner would only benefit the manufacturer.

- The hard-to-reach and fragmented nature of the foodservice market is a barrier, but manufacturers are dealing with it.

  Question 19 (How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?) had an average score of 3.6 with a CV of 0.28. This is a barrier but not a strong barrier and there is some disagreement about this barrier. The manufacturers and distributors scored this with an average of 3.5 and a CV of 0.36 which shows they disagree on this. This is because a few respondents indicated that EE equipment manufacturers have well-developed marketing strategies to reach all potential customers regardless of geographic and demographic barriers.

Ease of Adoption of EE CFS Emerging Technologies

- Upfront costs are the biggest barrier to adoption of EE CFS technologies

  Question 18 about up-front costs (How much of a barrier is the increased up-front cost?) has the highest average value for all market penetration barriers of 4.7 with a low CV of 0.14. This shows that there was universal agreement among the respondents that the high premiums in terms of cost for the adoption of the EE CFS technologies are a significant barrier. Most customers make decisions based on the short-term initial cost without considering the long-term payback or lifecycle costs. An exception is the distributor who claimed their sales were based more on lifecycle costs. However, this distributor is only selling high-end equipment where such an analysis is probably required considering the high cost of the equipment compared to other models. Most respondents work to educate customers on the benefits of lifecycle cost analysis to increase adoption. However, most independent restaurant owners only worry about the short-term investment, while large chains typically think long-term considering the payback over time.

- Lifecycle costs are a barrier to some customers but a lesser barrier than up-front costs

  Question 27 about lifecycle costs (How much of a barrier is higher lifecycle costs to the end user?) has a lower average score than question 18 and a higher CV (the average is 3.4 with a CV of 0.35). This further supports that lifecycle cost is a barrier for some customers but not others, and this could be the case because some customers simply don't consider the lifecycle costs. Some respondents thought it is a significant barrier for educated customers, typically large foodservice chains, that consider all primary and secondary costs over the product's lifetime. The score for this question was 3.8 for the manufacturers and distributors with a CV of 0.20 which shows that this group views this as more of a barrier than the technical experts and utility reps.

- Uncertainty about future codes and standards is a barrier for manufacturers and distributors

  Question 29 (How much of a barrier is the uncertainty of future foodservice codes/standards?) addressed the uncertainty in future codes and standards. Overall this question had an average score of 3.1 with a CV of 0.37 which would indicate it is not a strong barrier but there is disagreement about that. However, the average value for the manufacturers and distributor is 3.6 with a CV of 0.22 which shows that the manufacturers think this is a stronger barrier than the technical experts and utility reps. One respondent explained that they are unclear about future codes and standards for gas appliances specifically in the California market. This respondent felt that there should be more collaboration between policy makers and manufacturers to set codes & standards. According to the same respondent, they are focusing on investing in efficient electric CFS technologies for the California market until future regulations become predictable for CFS gas appliances.

Adoption Drivers and Market Barriers

Drivers

- Improved performance is the strongest driver

  The survey results for question 9 (How much of a driver is improved performance for the end-user?) has the highest overall average value of 4.5, with the lowest CV of 0.1, indicating that it is one of the most agreed upon among the respondents.

- Labor savings is another strong driver

  Question 15 (How much of a driver is labor savings from using new equipment, such as self-cleaning ovens?) had an overall average score of 4.4 with a CV of 0.23. Labor savings can come from features in EE CFS equipment such as self-cleaning ovens or "cook-and-hold" ovens. Respondent #4 indicated that automatic conveyor broilers can offer additional labor savings compared to traditional underfired or overfired broilers for high-volume specific applications, such as burgers, as the current labor shortages burden the CFS industry. For example, one automatic conveyor broiler model targets high-volume burger restaurants utilizing digital controls and pre-programmed cook time settings to communicate directly with the point of sale (POS) system without compromising food quality, and this broiler reduces labor costs by removing the need for an operator to stand at the broiler and flip burgers. However, there is sometimes added maintenance for these additional labor-saving features. An automatic conveyor broiler requires more daily maintenance than a traditional underfired broiler, but respondents did not think this additional labor for maintenance overtook the labor savings.

- Consolidating kitchen operations is the third largest driver

  Question 2 (How much of a driver is consolidating kitchen operations to offer additional products?) had an average score of 4.3 with a CV of 0.15. Most respondents agreed that increasing capacity would lead to increased sales. Thus, customers would be willing to adopt in those cases.

Barriers

- Upfront cost is the top barrier

  As mentioned previously, the top market penetration barrier is the high upfront cost to adopt EE CFS technologies. Question 18 (How much of a barrier is the increased up-front cost?) had an overall average score of 4.7 with a CV of 0.14.

- Current supply-chain issues are another barrier

  The following barrier is current supply-chain issues addressed via question 21 (How much of a barrier are current supply-chain issues?) which had a score of 4.6 with a CV of 0.20. Many agreed that supply chain issues are a barrier to EE technologies, especially for the smaller chains or independent restaurants.

- The third highest barrier is a lack of awareness of EE CFS products

  Question 23 (How much of a barrier is the lack of awareness?) had a score of 4.2 with a CV of 0.23. Most respondents agreed that customers are unaware of the high ROIs achieved with EE foodservice equipment. All respondents confirmed that customer decisions are usually made based on the short-term purchase price, and typically only when equipment fails. Only large foodservice chains consider the ROIs in their decision-making. Also, there is a need for foodservice customers to be educated about considering ROI in the decision-making process.

Distributor/Manufacturer vs Technical Expert/Utility Representatives

The top drivers and barriers were also examined with the survey responses broken down by the two (2) groups of DIST/MFG, and TE/UR. Table 17 shows the breakdown between the overall scores and the two groups regarding drivers and Table 18 shows the breakdown for barriers. Questions 16, 17, 31, 32, 33, 34 were not included in these tables because not all respondents answered those questions.

Table 17: Top Driver Breakdown

Driver	Overall Driver	DIST/MFG Driver	TE/UR Driver	Overall Avg/ CV	DIST/MFG Avg/CV	TE/UR Avg/CV
Q9: Improved performance	X	X	X	4.5/0.10	4.3/0.09	4.7/0.09
Q15: Labor Savings	X		X	4.4/0.23	3.9/0.31	4.8/0.08
Q2: Consolidating Kitchen Operations	X	X		4.3/0.15	4.2/0.18	4.4/0.11
Q13: Independent Verification of Performance		X		4.1/0.18	4.0/0.22	4.2/0.16
Q5: Easy Installation/Plug and Play			X	4.0/0.19	3.4/0.14	4.6/0.11

Table 18: Top Barrier Breakdown

Barrier	Overall Barrier	DIST/MFG Barrier	TE/UR Barrier	Overall Avg/ CV	DIST/MFG Avg/CV	TE/UR Avg/CV
Q18: Increased Up-Front Cost	X	X	X	4.7/0.14	4.5/0.17	4.8/0.8
Q21: Current Supply-Chain Issues	X	X	X	4.6/0.20	4.2/0.28	5.0/0.0
Q23: Lack of Awareness	X	X	X	4.2/0.23	4.2/0.28	4.2/0.18

As per Table 17, the additional top barriers from either the MFG/DIST group or TE/UR group were:

- Independent verification of performance
- Easy installation or plug-n-play equipment

The distributor/manufacturer group thought that independent verification of performance was more important than labor savings as a driver. The technical expert/utility rep group thought that easy installation or plug-n-play equipment was more important than consolidating kitchen operations.

The two (2) groups agreed overall on what the top barriers were. As shown in Table 18, they all ranked the same barriers in the top three (3) barriers, but they did not always agree on how important the barrier was.

Installing EE equipment

- Griddles and broilers are typically plug-n-play which is a driver in the opinion of technical experts and utility reps

The installation of EE equipment was captured via question 5 (How much of a driver are easy installations, or plug-n-play type situations?). The technical experts and utility reps scored this with a 4 or 5 because it plays a decisive role in adopting EE equipment. However, the manufacturers and distributors scored it at a 3 or 4, claiming that griddles and broilers are typically "plug-n-play" type appliances, so it does not act as a barrier or a driver.

Using EE equipment

- There is a misconception that energy efficiency sacrifices equipment production capacity or quality, but that opinion may be changing

  As aforementioned, when using EE equipment, improved performance is very important for the end-user. Several respondents indicated that the common conception in the market is that when energy efficiency goes up, the equipment is unable to produce the same amount of food in the same amount of time as an inefficient piece of equipment. Question 24 (How much of a barrier is the misconception that efficiency is achieved at the cost of performance?) was included to address the common misconception that energy efficiency is achieved at the cost of performance. This question had an average score overall of 3.3 with a CV 0.4 indicating it is a barrier but not a strong one. The average score from the utility reps and technical experts was 3.5 with a CV of 0.26 while the average score for the distributors and manufacturers was 3.2 with a CV of 0.5. The technical experts and utility reps thought this was more of a barrier than the manufacturers and distributors did. The 0.5 CV from the manufacturer and distributor response indicates there is disagreement among this group about this being a barrier. This high CV could mean that opinions in the CFS market about performance and energy efficiency are changing.

- Restaurant owners are not concerned with GHG savings at this time, but this may be shifting

  Question 3 (How much of a driver is the customer's willingness to reduce dependence on fossil fuels?) had the lowest score overall of 2.6 with a CV of 0.41. Since the CV is higher than 0.3 it indicates there is disagreement on this question. The manufacturers and distributors average score was 1.9 with a CV of 0.11 which shows they all agree that the restaurant owners are not concerned with reduced dependence on fossil fuels. Most respondents indicated that customers are not considering GHG emissions when buying new CFS equipment. However, a few stated that GHG emissions are becoming a growing concern and that they see the market shifting towards that trend in the coming years.

- There may be a need to educate restaurant owners/operators on proper maintenance of Low NO_x burners

  During one of the first SME interviews, a respondent indicated that advanced designs including Low NO_x burners sometimes require additional maintenance and are not always properly maintained. Therefore, question 32 (How much of a barrier is improper maintenance of advanced designs? i.e., Low-NO_x burners) was added to the survey and had an average score of 3.5 with a CV of 0.29. This indicates that this may be a barrier but there is not widespread agreement on it.

- New or added features with EE equipment can be a driver for large chains

  Question 6 (How much of a driver are new or advanced features for the end-user?) had an average overall score of 3.8 with a CV of 0.23 indicating this is a driver but not a strong one. However, the manufacturers/distributors scored this with an average of 3.2 with a CV of 0.125 while the technical experts/utility reps scored this with an average of 4.4 and a CV of 0.18 which shows that the two groups disagree on this question. Several manufacturers thought added features were not as important as long as the equipment serves the same basic need, However, some technical experts found this very important as a driver when dealing with large chains that can take advantage of the additional features.

- The need for operator training on advanced controls can be a barrier

  Question 30 (How much of a barrier is the lack of employee/operator training?) had an average score of 3.3 with a CV of 0.42 indicating disagreement on this question. Some respondents felt it was a strong barrier and gave a score of 4 or 5 and others felt it was not a barrier giving it a score of 1 or 2. The manufacturer/distributor group had a higher overall average of 3.6 but with a CV of 0.38 and the technical expert/utility rep group had a lower overall score of 3.0 but with a higher CV of 0.46 which shows that both groups didn't agree amongst themselves. This indicates that advanced controls can be a barrier, but operators may be more comfortable working with the controls as more EE CFS equipment has entered the market over the years.

- Additional maintenance and a lack of maintenance personnel can act as a barrier

  Some EE CFS technologies require additional maintenance like the automatic conveyor broiler. Question 33 (How much of a barrier is added maintenance with a conveyor broiler vs. an underfired broiler?) was included to address this. Only six (6) respondents answered this question, and all but one (1) respondent scored it with a 4 or 5 because operators need to be adequately trained to perform the maintenance. Only Respondent #3 scored this low with the explanation that buyers do not consider operating failures when purchasing EE equipment. One thing to note is the lack of maintenance personnel reported by several respondents. Although,

question 31 (How much of a barrier is the lack of maintenance personnel?) had a score of 3.7 with a CV of 0.33 regarding the lack of maintenance personnel, these respondents made it clear there is an urgency for more qualified technicians for more advanced EE equipment. Experienced technicians are not familiar with most EE CFS technologies, so there is a growing need for a newly educated technician workforce that can meet the growing demand for servicing for these high-priority CFS technologies.

- Drivers for dry-well steam tables are reduced water costs and more uniform temperature distribution

  When respondents answered question 17 (How much of a driver are the added advantages of dry-well vs. wet-bath steam tables?), a few respondents said that the dry-well steam table advantages act as a strong driver by reducing water costs and providing a more uniform temperature distribution that prevents food from burning or dropping below the ideal temperatures for food safety. When using wet-well steam tables where there is not a uniform temperature distribution and operators increase energy usage to ensure the ideal temperature is maintained. Question 16 (How much of a driver for steam tables is to maintain food at the ideal temperatures?) had an average score of 3.7 with a CV of 0.3.

Installation and commissioning costs

Since most of the high priority EE CFS technologies selected for this study are easy to install, or even modular applications, installation costs are generally on the lower side. However, most respondents confirmed that the high premiums in terms of equipment cost for the adoption of the emerging foodservice technologies are a significant barrier. Pricing data is not available for made-to-order (MTO) or customized ordered models found on the qualifying products list. Specifically, regarding the underfired broilers, Garland brand GTXHP underfired broiler pricing is only available for the GTXHP-36 at $16k from WebstaurantStore (Webstaurant Store, Inc., 2022). This is well above the average price of the other similar qualifying underfired broilers of about $4-7K, i.e., the Royal Range RIB-36 (JES Restaurant Equipment, 2022) and RIBT-36 (JES Restaurant Equipment, 2022) with similar widths and rebates per unit, but about half the maximum input rate. Thus, there is an opportunity to show savings on commissioning costs with a lifecycle cost analysis to incentivize more adoption of these high premium qualifying products. However, the Study Team was not able to get information directly from Garland about details of their product.

Survey Response Variation

Market Driver Variations

There is the most response variation found among the following market penetration drivers with CV greater than 0.3.

Table 19: Market Driver Survey Response Variation

Question	Average	Range	CV
Q1: How much of a driver is commissary kitchen services?	2.7	1-4	0.32
Q3: How much of a driver is the customer's willingness to reduce dependence on fossil fuels?	2.6	1.5-5	0.41
Q4: How much of a driver is the compliance with environmental/worker safety regulations?	3.3	2-5	0.37
Q7: How much of a driver is the recyclability of emerging foodservice equipment?	2.2	1-4	0.39

Question 1 regarding the trend of commissary kitchen operations as a driver scored at 2.7 with a noticeable CV of 0.32. Looking at the results by interviewee type, the distributors and manufacturers scored this lower at 2.3 with a high variance of 0.43. The technical experts and utility reps scored this question higher at 3.1 with a much lower variance of 0.16. This shows that the midstream and upstream markets do not agree this trend is a driver.

There was widespread disagreement on GHG savings (question 3) with a CV of 0.41. The distributors and manufacturers did not think this was a driver with a score of 1.9 and a very low variance of 0.11. Some technical experts and utility reps indicated there is a growing trend towards GHG savings in commercial kitchens as this group scored this question higher at 3.2. However, others indicated that is not an important factor in the decision-making process, thus, reflecting the high CV of 0.35.

The compliance with environmental and work health regulations (question 4) gave mixed reactions, as some indicated a push towards more worker safety in EE equipment, but others claiming that it's not that important. Both distributors/manufacturers and technical experts/utility reps have considerable CVs of 0.42 and 0.31, respectively. But the distributors and manufacturers scored this lower at 3.2 compared to 3.5 for technical experts and utility reps showing the distributor/manufacturer group is not as concerned about safety regulations as they typically account for safety protocols during the design phase.

Lastly, there was considerable variance regarding the recyclability (question 7) with a CV of 0.39 and a low score of 2.2 as most respondents never considered this when offering EE equipment but some found it important in the long term. The distributors and manufacturers scored this even lower 1.8 with a low variance of 0.22. However, the technical experts and utility reps scored it at 2.5 with a high variance of 0.40. Thus, the distributor/manufacturer group does not take into account the recyclability of their technologies during the design phase.

Market Barrier Variations

For the market penetration barriers, the most response variation was found among the following questions with CVs above 0.35.

Table 20: Market Barrier Survey Response Variation

Question	Average	Range	CV
Q20: How much of a barrier is the lack of readily available energy-efficient foodservice equipment?	3.6	1-5	0.38
Q24: How much of a barrier is the misconception that efficiency is achieved at the cost of performance?	3.3	1-5	0.40
Q26: How much of a barrier is the considerable variation in unit pricing?	2.95	2-5	0.39
Q27: How much of a barrier is higher lifecycle costs to the end user?	3.4	1-5	0.35
Q28: How much of a barrier is the end user's lack of awareness of GHG savings?	2.9	2-5	0.45
Q29: How much of a barrier is the uncertainty of future foodservice codes/standards?	3.1	2-5	0.37

The respondents overall agreed on the top three (3) barriers as discussed before. However, Table 20 shows a considerable amount of disagreement among the respondents for the rest of the barrier questions, as six (6) of fourteen (14), or 42%, of the response CVs for the remaining questions were above 0.35. Lack of readily available supply (question 20) was found to be a more significant barrier among the distributors/manufacturers with a score of 3.8 and a CV of 0.38, compared to the technical experts/utility reps that scored it slightly lower at 3.4 with a larger variance of 0.48. The distributors and manufacturers were in more agreement, but some did not consider this a barrier because they only provide made-to-order, or customized units, and can manufacture them without long lead times.

The large variation in unit pricing due to online sales and bulk sales (question 26) was not agreed upon as a barrier. Most respondents considered this a barrier only in some cases,

depending on the type of EE equipment. Looking at the results for question 26 by interviewee type, both the distributors/manufacturers and technical experts/utility reps scored about the same at an average of 3.0 and 2.9, respectively, and very similar CVs of 0.37 and 0.38, respectively.

There is also disagreement that higher lifecycle costs act as a barrier (question 27) with a CV of 0.35. Some respondents indicated this can be a barrier for more educated customers, but most customers do not consider this when buying EE equipment. The distributors and manufacturers scored this at 3.8 with a low variance of 0.20, but the technical experts/utility reps scored this question at 3.0 with a high variance of 0.47. Thus, the technical experts and utility reps did not closely agree that higher lifecycle costs are a barrier.

As for lack of awareness of GHG savings (question 28), it seems respondents were in widespread disagreement that customers are driven by GHG savings with the highest overall CV of 0.45. The variation among distributors and manufacturers and technical experts and utility reps were about the same with a high CV of 0.42 and 0.46, respectively. Thus, both groups widely disagreed. This disagreement was also seen in the results to driver question 3 (How much of a driver is the customer's willingness to reduce dependence on fossil fuels?) which had an overall CV of 0.41. This could indicate that the market is shifting in its overall awareness of GHG savings, so opinions are starting to change.

Lastly, there was considerable variance regarding uncertainty of future codes and standards (question 29) with a CV of 0.37. The technical experts and utility reps scored this low at 2.6 but with a high variance of 0.46 as some of these respondents claimed that uncertainty acts as a barrier to emerging technologies that have not entered the market yet. The distributors and manufacturers scored this higher at 3.6 with about half the variance of 0.22. This shows that the distributors and manufacturers are more concerned about future codes and standards regarding their EE products.

Customer Surveys

The final task of the project was to collect customer feedback from SoCalGas restaurant owners or managers who have installed at least one (1) of the four (4) selected EE Commercial Foodservice (CFS) measures.

1) Commercial Griddle (SWFS004)
2) Commercial Underfired Broiler (SWFS019)
3) Commercial Automatic Conveyor Broiler (SWFS017)
4) Steam Tables (No current measure package)

Interviewees comprised a combination of chain restaurants and independently owned restaurants. Lincus was unable to contact any institutional facilities although they were in the original scope. Lincus interviewed these restaurant owners/managers to understand the following:

- Perceptions on the advantages/disadvantages of each piece of EE CFS equipment installed
- Perception on the performance of the EE CFS equipment, including both energy and non-energy performance
- Intent to install more EE CFS equipment in the future and why or why not
- Would the owner/manager recommend EE CFS equipment to other restaurant owners/managers, and why or why not
- Additional suggestions to overcome the barriers to the installation of CFS equipment

Target Audience

This survey targeted thirty (30) SoCalGas commercial foodservice customers (restaurant owners or managers) that have installed one (1) or more of the three (3) existing high priority EE CFS measures within the last five (5) years. These restaurant owners/managers claimed rebates for Griddles, Underfired Broilers, and/or Automatic Conveyor Broilers. Currently, there is no EE measure for steam tables, so restaurant owners/managers are not incentivized to upgrade to more energy-efficient models. This survey also aimed to gather information regarding current steam table specifications and general technology awareness from restaurant owners and managers with steam tables to help establish an EE CFS measure for energy-efficient steam tables.

The griddle and automatic conveyor broiler interviewees were large-chain restaurants. The target audience was the franchise owner, property management, or corporate office because several restaurant managers indicated they are not the ultimate financial decision-makers in energy efficiency upgrades. Underfired broiler interviewees were independently owned restaurants, where the target audience was the owner in charge. When the owners or property management were unavailable, the survey was conducted with available restaurant management or kitchen staff that could provide meaningful responses. These respondents provided the equipment operators' perspectives instead of only the business owners.

Survey Questionnaire

The survey questionnaire is divided into two categories: the general survey that covers the three (3) existing EE measures and another survey specifically for steam tables. The questions are aimed at the decision-maker for kitchen equipment upgrades. However, this is only sometimes the case, so it also includes the perspective of the management and kitchen staff to give different perspectives of the first-hand operators, as opposed to the business owners. The general survey questions for the three (3) existing EE CFS measures can be found below.

General Survey Questions

1. How happy are you with the energy efficiency upgrade experience?
2. What one factor influenced that score? Please explain.
3. How happy are you with equipment performance vs. stated performance?
4. Have you tracked your energy consumption data before and after the upgrade?
5. If yes, please rate the energy performance on a scale from 1-5.
6. How happy are you with the cooking experience with the new equipment?
7. What is the most significant advantage of the new equipment upgrade?
8. What is the most significant disadvantage of the new equipment upgrade?
9. How likely are you to recommend this equipment to others, and why?
10. How likely are you to adopt other EE equipment for your operations, and why?
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?

Steam Table Survey Questions

1. Do you have steam tables?
2. How many steam tables do you have?
3. What are the number of pans for each steam table?
4. Is the steam table a wet or dry-well configuration?
5. Is the steam table electric or gas?
6. Is it custom-made or off-the-shelf?
7. Do you use lids for the steam table pans?
8. How are the burners controlled? (knob, electric set point/other)
9. Do you know the burner rating, or heating capacity in Btu/hr or Watts, if electric?
10. If yes, please provide the rating in Btu/hr or Watts, if electric?
11. What types of foods are heated in the pans?
12. What are the days of operation?
13. What are the operating hours per week?
14. Where is the steam table located (kitchen/dining room)?

Customer Responses

A portion of the general survey responses were recorded using a 5-Point Likert Scaling system to maintain consistency and provide quantifiable answers for statistical analysis. The remaining questions are open-ended to include descriptive feedback on the EE CFS measure being questioned as it gives the respondents freedom to express themselves in more detail. The steam table survey only includes open-ended questions to get information on current steam table usage and awareness by. These questions focus on quantity, pan configuration, source energy type, burner configuration, types of heated food, and days/hours of operation, which aims to analyze general customer awareness and the need for steam table incentives.

The average, standard deviation (SD), and coefficient of variations (CV) are included for later analysis. Tables comparing the quantifiable questions for the three (3) EE CFS measures and steam tables to provide a statistical analysis are shown below.

Results by Equipment Type

In this section, the results from the customer surveys by equipment types are shown. Table 21 shows the results for automatic conveyor broilers,

Table 22 shows the results for griddles, and

Table 23 shows the results for underfired broilers. Table 24 shows the percentage of restaurant owners/managers who track their energy consumption from question 4.

Respondent No.	Q1: How Happy are You with EE upgrade Experience?	Q3: How Happy Are You with Equipment Performance?	Q4: Have You Tracked Energy Consumption?	Q5: Rate Energy Performance	Q6: How Happy Are You with Cooking Experience?	Q9: How Likely Are You to Recommend This Equipment to Others?	Q10: How Likely Are You to Adopt Other EE Equipment for Your Operations?
17	4	4	N	-	4	5	5
18	5	5	N	-	5	5	5
19	5	5	N	-	5	4	5
20	5	5	N	-	5	5	5
21	5	5	N	-	5	5	5
22	5	5	N	-	5	5	5
23	5	5	N	-	5	5	5
24	5	5	N	-	5	5	5
Average:	4.88	4.88	N	-	4.88	4.88	5.0
SD:	0.33	0.33	-	-	0.33	0.33	0
CV:	0.07	0.07	-	-	0.07	0.07	0

Table 24

Table 21: Automatic Conveyor Broiler Customer Survey Responses

Respondent No.	Q1: How Happy are You with EE upgrade Experience?	Q3: How Happy Are You with Equipment Performance?	Q4: Have You Tracked Energy Consumption?	Q5: Rate Energy Performance	Q6: How Happy Are You with Cooking Experience?	Q9: How Likely Are You to Recommend This Equipment to Others?	Q10: How Likely Are You to Adopt Other EE Equipment for Your Operations?
1	4	4	N	-	5	4	5
2	5	5	N	-	5	5	5
3	5	5	Y	5	5	5	5
4	3	4	N	-	3	5	5
5	5	5	Y	5	5	5	5
6	4	4	N	-	5	4	4
7	5	5	Y	5	5	5	5
Average:	4.43	4.57	-	5	4.71	4.71	4.86
STD:	0.73	0.49	-	0	0.70	0.45	0.35
CV:	0.16	0.11	-	0	0.15	0.10	0.07

Table 22: Griddle Customer Survey Responses

Respondent No.	Q1: How Happy are You with EE upgrade Experience?	Q3: How Happy Are You with Equipment Performance?	Q4: Have You Tracked Energy Consumption?	Q5: Rate Energy Performance	Q6: How Happy Are You with Cooking Experience?	Q9: How Likely Are You to Recommend This Equipment to Others?	Q10: How Likely Are You to Adopt Other EE Equipment for Your Operations?
8	5	5	N	-	5	5	4
9	5	5	N	-	5	5	5
10	5	5	N	-	5	5	4
11	5	5	Y	5	5	5	5
12	5	-	N	-	5	5	5
13	5	5	N	-	5	5	5
14	5	5	Y	5	5	5	5
15	5	5	N	-	5	5	5
16	3	2	N	-	2	2	4
Average:	4.78	4.44	-	5	4.67	4.67	4.67
STD:	0.63	1.07	-	0	0.94	0.94	0.47
CV:	0.13	0.24	-	0	0.20	0.20	0.10

Table 23: Underfired Broiler Customer Survey Responses

Respondent No.	Q1: How Happy are You with EE upgrade Experience?	Q3: How Happy Are You with Equipment Performance?	Q4: Have You Tracked Energy Consumption?	Q5: Rate Energy Performance	Q6: How Happy Are You with Cooking Experience?	Q9: How Likely Are You to Recommend This Equipment to Others?	Q10: How Likely Are You to Adopt Other EE Equipment for Your Operations?
17	4	4	N	-	4	5	5
18	5	5	N	-	5	5	5
19	5	5	N	-	5	4	5
20	5	5	N	-	5	5	5
21	5	5	N	-	5	5	5
22	5	5	N	-	5	5	5
23	5	5	N	-	5	5	5
24	5	5	N	-	5	5	5
Average:	4.88	4.88	N	-	4.88	4.88	5.0
SD:	0.33	0.33	-	-	0.33	0.33	0
CV:	0.07	0.07	-	-	0.07	0.07	0

Table 24: Tracking Energy Consumption

General Survey Question	% Of Total
Q5: Percentage of Respondents that Track Energy Consumption	21%

Results by Interviewee Type

In this section, the results from the surveys by interviewee type are shown by categorizing two groups: (1) owners and (2) managers/cooks. Table 25 shows the results from the owners,

Table 26 shows the results from managers, assistant managers, and cooks. The two groups give different perspectives as the owners typically are not directly using the equipment upgrades but are the decision-makers for the equipment upgrades based on the feedback from the managers and cooks. The managers and cooks have firsthand experience with the equipment upgrades, so they can speak more to the performance and ease-of-use.

Table 25: Survey Responses for Restaurant Owners

Respondent No.	Equipment Type	Q1: How Happy are You with EE upgrade Experience?	Q3: How Happy Are You with Equipment Performance?	Q4: Have You Tracked Energy Consumption ?	Q5: Rate Energy Performance	Q6: How Happy Are You with Cooking Experience?	Q9: How Likely Are You to Recommend This Equipment to Others?	Q10: How Likely Are You to Adopt Other EE Equipment for Your Operations?
1	AB	4	4	N	-	5	4	5
2	AB	5	5	N	-	5	5	5
3	AB	5	5	Y	5	5	5	5
14	GR	5	5	Y	5	5	5	5
15	GR	5	5	N	-	5	5	5
17	UB	4	4	N	-	4	5	5
19	UB	5	5	N	-	5	4	5
20	UB	5	5	N	-	5	5	5
21	UB	5	5	N	-	5	5	5
24	UB	5	5	N	-	5	5	5
	Average:	4.80	4.80	-	5.00	4.90	4.80	5.00
	STD:	0.61	0.75	-	0	0.72	0.66	0.37
	CV:	0.13	0.16	-	0	0.15	0.14	0.07

[AB = Automatic Conveyor Broiler, GR = Griddle, UB = Underfired Broiler]

Table 26: Survey Responses for Restaurant Managers/Cooks

Respondent No.	Equipment Type	Q1: How Happy are You with EE upgrade Experience?	Q3: How Happy Are You with Equipment Performance?	Q4: Have You Tracked Energy Consumption ?	Q5: Rate Energy Performance	Q6: How Happy Are You with Cooking Experience?	Q9: How Likely Are You to Recommend This Equipment to Others?	Q10: How Likely Are You to Adopt Other EE Equipment for Your Operations?
4	AB	3	4	N	-	3	5	5
5	AB	5	5	Y	5	5	5	5
6	AB	4	4	N	-	5	4	4
7	AB	5	5	Y	-	5	5	5
8	GR	5	5	N	-	5	5	4
9	GR	5	5	N	-	5	5	5
10	GR	5	5	N	-	5	5	4
11	GR	5	5	Y	5	5	5	5
12	GR	5	3	N	-	5	5	5
13	GR	5	5	N	-	5	5	5
16	GR	3	2	N	-	2	2	4
18	UB	5	5	N	-	5	5	5
22	UB	5	5	N	-	5	5	5
23	UB	5	5	N	-	5	5	5
	Average:	4.64	4.50	-	5.00	4.64	4.71	4.71
	STD:	0.61	0.75	-	0	0.72	0.66	0.37
	CV:	0.13	0.17	-	0	0.16	0.14	0.08

[AB = Automatic Conveyor Broiler, GR = Griddle, UB = Underfired Broiler]

Steam Table Results

The results for the surveys for steam tables are presented below. Table 27 shows the results for steam tables located in restaurant kitchens and Table 28 shows the results for buffet style steam tables located in the restaurant dining area.

Table 27: Kitchen Steam Table Responses

Respondent No.	Cuisine Type	Q2: How many Steam Tables	Q3: Number of Pans	Q4: Wet-Well/Dry-Well	Q5: Electric/Gas	Q6: Custom-made/Off-the-Shelf	Q7: Do You Use Lids?	Q9: Do you Know Burner Rating/Heating Capacity?	Q12: Days of Operation/Week	Q13: Hours of Operation/Day
25	Middle Eastern	2	2	W	E	O	Y	N	7	12
26	American	2	4	W	E	O	Y	N	7	10.5
27	American	1	6	W	G	O	N	N	7	11
	Average:	1.67	4.0	-	-	-	-	-	7	11.17
	SD:	0.47	1.63	-	-	-	-	-	0	0.62
	CV:	0.28	0.41	-	-	-	-	-	0	0.06

[W = Wet-well, D = Dry-well, E = Electric, O = Off-the-Shelf, C = Custom]

Table 28: Dining Room Steam Table Responses

Respondent No.	Cuisine Type	Q2: How many Steam Tables	Q3: Number of Pans	Q4: Wet-Well/Dry-Well	Q5: Electric/Gas	Q6: Custom-made/Off-the-Shelf	Q7: Do You Use Lids?	Q9: Do you Know Burner Rating/Heating Capacity?	Q12: Days of Operation/Week	Q13: Hours of Operation/Day
28	American	33	2	W	E	O	N	Y	7	12
29	American	34	2.5	W	E	O	N	Y	7	12
30	Chinese	2	12	D	E	C	N	N	7	13
	Average:	23	5.5	-	-	-	-	-	7	12.3
	SD:	14.9	4.6	-	-	-	-	-	0	0.5
	CV:	0.6	0.8	-	-	-	-	-	0	0.04

[W = Wet-well, D = Dry-well, E = Electric, O = Off-the-Shelf, C = Custom]

Table 29: Overall Steam Table Responses

Steam Table Question	% Of Total
Q4: Percentage of Wet-Well Steam Tables	84%
Q5: Percentage of Gas Steam Tables	17%
Q6: Percentage of Off-the-Shelf Steam Tables	84%
Q7: Percentage Using Steam Table Pan Lids	33%
Q9: Percentage of Respondents Aware of Steam Table Capacity	33%

Advantages/Disadvantages

The results of question 7 (What is the most significant advantage of the new equipment upgrade?) and question 8 (What is the most significant disadvantage of the new equipment upgrade?) are used for the analysis of the perceived advantages and disadvantages of each of the three (3) existing EE CFS measures. The questions were kept open-ended to allow the respondents to express their perspectives on the advantages and disadvantages. The following sections provide more detail about the advantages and disadvantages specific to the three (3) existing high-priority CFS technologies.

Automatic Conveyor Broiler

Advantages

- Reduced labor costs
- Ease of use
- Energy bill savings
- Less heat radiated into kitchen/less operator discomfort or risk of heat illness
- High quality food output
- Increased food output

The respondents unanimously agreed that the automation of the automatic conveyor broiler was a significant advantage because it helps reduce labor costs and is intuitively easy to use. A few respondents mentioned that saving on energy utility bills was the most significant advantage. Most respondents indicated that the newer conveyors meet expectations with very few issues. Respondent #5 specified that the upgraded equipment radiates negligible heat into the kitchen. Thus, it provides more safety against heat discomfort and/or illness for the operators. Respondents that use the automatic conveyor broilers for cooking burgers specifically reported ease of use and high-quality food cooking output. Respondent #7 indicates that the upgrade allows for more robust heating capacity and increased food output.

Disadvantages

- Preparation and cleaning are cumbersome
- Chicken fillets do not cook on the first pass
- Long lead time for replacement parts
- Ignitor issues

Several respondents reported that the preparation and cleaning of the equipment is cumbersome. However, the effect on labor is negligible. Respondent #6 reported issues with long-lead times for replacement parts. Respondent #5 reported issues with the ignitor, as it sometimes does not function properly. Respondents #4 and #7 used the automatic conveyor broiler to cook chicken filets and reported issues with the chicken not being fully cooked through during the first pass of the conveyor. This issue may indicate that these specific automatic broilers are more applicable to cooking burgers or there is a lack of customer training in properly calibrating the equipment to cook specialty meat filets. This kind of an issue could add to the perception that EE CFS equipment does not have the same product output as the incumbent equipment.

Griddles

Advantages

- Faster cooking times
- Easy-to-control, uniform temperature distribution
- Consistent cooking output
- More efficient cooking operation
- More ergonomic for operators
- Easier to maintain
- Increased reliability

Most respondents indicated the most significant advantage of the upgraded energy-efficient griddle was fast cooking times and easy-to-control uniform temperature distribution, allowing for consistent cooking output. Another significant advantage is the smaller design that allows for more efficient operations. More specifically, respondent #16 explained that upgrading to a smaller, more efficient griddle allowed for installing an additional fryer. Furthermore, respondent #14 specified that the lightweight, low-height designs are ergonomic for operators and make them easy to maintain. Respondent #14 also indicated that the multiple burners increased reliability by allowing for a portion of the burners to fail without operational downtime. The company previously used single burner griddles as a standard for all restaurants, so there were no backup burners to prevent operational downtime when burner failure occurred.

Disadvantages

- Less food output
- Complex controls

Respondent #16 stated that while smaller griddle allowed the installation of an additional fryer, the smaller griddle increases customer wait-times by reducing food output during peak demand. From a manager's perspective, this interviewee prefers the prior griddle that provided a larger cooking surface to meet the demand. However, the owner selected the smaller griddle to make space for an additional fryer which should offset the griddle change. This could also add to the perception that EE CFS equipment does not have the same food production output and points to a need for customer education to select the appropriately sized equipment for a specific restaurant operation.

Underfired Broiler

Advantages

- High food quality
- Ease of use
- Less heat wasted to environment
- Increased prevention of heat illness for operators
- Faster cooking times

EE underfired broilers were previously thought to reduce food quality. This perception was primarily the result of the impression that more efficient burners could result in lower heating capacity and longer cooking times. However, all respondents reported high food quality output and ease of use for the upgraded EE underfired broilers. Respondent #21 indicated that the burners direct the heat more to the food, and less is wasted to the environment resulting in increased prevention of heat illness for the operators. Respondent #22 stated that the underfired broiler cooks uniformly, allowing for consistent, high-quality food output. Also, they said that the lack of open flames prevents flare-ups and maintains high food quality.

Disadvantages

- Less food production
- Long warm-up period
- High upfront cost

Respondents #17 and #18 indicated that underfired broilers do not cook food fast enough, and it takes a considerable time to heat up to the required temperature meaning the equipment is not ideal during lunch rushes. However, they did not mention anything about decreased food quality. However, respondent #20 indicated that upgraded broilers provide faster cooking times. So, correctly applying the high-efficiency underfired broiler to kitchen

operations is key to overcoming this cooking time barrier. High upfront costs were reported as a disadvantage by respondents #18 and #19.

Several respondents did not report any noticeable disadvantages. Thus, the underfired broiler shows good customer feedback assuming the customer applies the upgrade appropriately to maintain efficient operations.

Customer Perception of Equipment Performance

Energy Performance

Even when respondents reported disadvantages, all respondents reported excellent performance for the three (3) EE CFS measures. For the most part, the equipment exceeded the customers' expectations. Question 3 (How happy are you with equipment performance vs. stated performance?) was included in the general survey to quantify customer satisfaction with actual performance vs. stated performance. The high average of 4.88 for underfired broilers (

Table 23), 4.57 for automatic conveyor broilers (Table 21), and 4.44 for griddles (

Table 22) confirms that equipment performance did meet or exceed most respondents' expectations. The lower score for the griddle is attributed to respondent #16, who was unsatisfied with the upgraded griddle because the smaller cooking surface did not meet the demand expectations.

However, only 21% of the total survey respondents tracked their energy performance and the remaining 79% did not. Respondent #4 indicated that the owner would be much more willing to increase adoption if the cost savings could be quantified before purchasing. A suggestion to overcome this barrier is to use quantifiable energy savings to provide a cost-benefit analysis to encourage technology adoption. Respondent #14 indicated that cost-effectiveness is the most critical factor to consider before implementing additional energy efficiency upgrades, which can be addressed with a complete cost-benefit analysis.

Non-Energy Performance

Over the course of interviews, there were several non-energy performance benefits and issues found. Benefits included:

- Better ergonomics

  Ergonomics includes ease of use, productivity, safety, and comfort. Respondents for all three (3) existing technologies reported ease of use and increased productivity associated with the equipment upgrades. Respondents for the underfired and automatic conveyor broilers indicated increased worker safety and comfort. Additionally, respondent (14) said the upgraded griddles made were easier to use due to the improved splash guards, lowered cooking surface height and reduced weight to help with cleaning.

Issues included:

- Complicated controls

  Respondent #8 mentioned issues with the complicated controls associated with the upgraded griddles. This issue may be due to a lack of operator training or awareness; however, it may also be due to manufacturers' decisions to package more complex controls together with high efficiency units even though high efficiency does not always necessitate complex controls.

- Product Quality

  Respondents with automatic conveyor broilers used for cooking chicken reported problems with food doneness. Specifically, respondent #4 indicated the requirement for additional operator training to ensure food doneness through multiple passes. This may be due to a lack of operator training or the need for a larger model with increased cooking capacity.

- Difficulty Repairing

  Respondent #6 mentioned that the automatic conveyor broilers are difficult to repair due to the complex designs and the specialty parts having long delivery lead times due to current supply chain problems.

- Reduced food production/production not meeting demand

  Out of twenty-four (24) respondents related to the three (3) existing CFS measures, five (5) of them reported issues with the production capacity of their equipment. Respondents #4 and #7 (automatic conveyor broiler) had issues with chicken fillets not being fully cooked through during the first pass. Respondent #16 (griddle) stated that the griddle reduces food output during peak demand. Respondents #17 and #18 (underfired broiler) indicated that the broilers do not cook food fast enough.

Additional Discussion

- Overall restaurant owners and managers are satisfied with EE CFS upgrades

Question 1 (How happy are you with the EE upgrade experience?), question 3 (How happy are you with equipment performance?) and question 6 (How happy are you with the cooking experience?) all had an average score at or above 4.44 across Tables 21–26. The lowest average score of 4.44 comes from

Table 22 which summarizes the responses for griddles and is lowest because of respondent #16 on question 3 because the smaller cooking surface does not keep up with the lunch demand. All other responses for questions 1, 3, and 6 were a 4 or a 5 which shows most respondents view the EE CFS upgrades positively.

- Restaurant owners and managers are likely to adopt other EE CFS equipment in the future.

  Question 10 (How likely are you to adopt other EE equipment for your operations, and why?) was included in the general survey, which explicitly asks about the intent to install more EE equipment in future operations. This question had an average score of 5.0 with a CV of 0.0 among restaurant owners and an average of 4.71 with a CV of 0.08 among managers/cooks. The lower average for managers and cooks was due to one (1) automatic conveyor broiler and three (3) griddle respondents rating this question with a 4. All respondents indicated that further adoption highly depends on the lowered upfront costs from rebates or incentives. Some respondents indicated that reducing emissions and helping the environment were the driving factors to increase adoption, but from an owner's perspective, saving money on energy costs is the most significant influence to increase adoption.

- Restaurant owners and manager are likely to recommend their EE CFS equipment to others

  Question 9 (How likely are you to recommend this equipment to others, and why?) was included in the survey to explicitly address the interviewees' willingness to recommend these technologies to other restaurants. This question had an average of 4.8 with a CV of 0.14 from the owners and an average of 4.71 with a CV of 0.14 from the managers/cooks. Only respondent #16 gave it a score of 2 for griddles based on the smaller griddle size that affects operations during peak demand. Thus, the results show a promising outlook given that more customers are aware of the excellent performance benefits and the benefits of saving money on energy costs.

- Respondents who track energy savings are satisfied with equipment energy performance

  The respondents that tracked energy consumption gave a score of 5 for question 5 (Rate energy performance). This shows that when equipment energy performance is tracked, restaurant owners/managers are able to see the increase in efficiency and are highly satisfied with the results.

- Few respondents track energy savings and there is an opportunity to provide tools to help track energy savings

Only 21% of the total survey respondents tracked the energy consumption before and after the energy efficiency upgrade (Table 24). So, most respondents are unaware of the actual energy savings, as the remaining 79% have not considered tracking energy savings. Thus, this may be a barrier because customers may need to be fully aware of the potential savings to encourage technology adoption. Respondent #4 indicated that the owner would be much more willing to increase adoption if the cost savings could be quantifiable before purchasing. However, respondent #14 stated that rapid fluctuations in the cost of natural gas and the increasing cost of electricity in California have made it difficult to track energy consumption accurately. These changes did not allow quantifying energy performance with exact therms or kWh savings. A suggestion to overcome this barrier would be providing guidelines for an energy tracking process that accounts for the market price fluctuations and provides quantifiable energy savings that supports adopting EE equipment. Another suggestion is to use quantifiable energy savings to provide a cost-benefit analysis to encourage technology adoption. Respondent #14 indicated that cost-effectiveness is the most critical factor to consider before implementing additional energy efficiency upgrades, which can be addressed with a complete cost-benefit analysis.

Steam Tables

There were six (6) surveys conducted for steam tables, with three (3) focusing on steam tables located in the kitchen and three (3) focusing on steam tables found in buffet-style dining rooms. The Study Team was unable to get more customer responses using the outreach methods in this study so the team was unable to get more respondents with gas-fired steam tables.

All respondents, except respondent #27, have electric steam tables. All respondents except respondent #30 have wet-well steam tables. Respondent #30 has custom-built dry-well steam tables to accommodate fast-casual dining for serving Chinese food and prefers dry-well steam tables to save on labor costs and remove the need for water. However, they did not specify a preference for using electric vs. gas dry-well steam tables.

All other respondents besides respondent #30 indicated they have and prefer off-the-shelf steam tables to reduce upfront costs. Respondents #28 and #29 who have buffet-style steam tables explained that countertops are built around off-the-shelf steam tables and that corporate only specifies standard specifications for steam table operations but does not require specific manufacturers or models. The standard is wet-well water temperatures at 180°F and food at or above 160°F. The kitchen steam table respondents were unaware of the steam table heating capacity. They were not concerned about the performance of steam tables, generally they were only used for plate finishing elements, i.e., sauces and garnishes.

The Frontier Energy ET (Frontier Energy, 2020) study also did a market survey of steam tables and those results are combined with the results from this study in Table 30.

Table 30: Gas vs. Electric Steam Tables

	Frontier Energy ET Study	This ET Study	Total	Percentage
Total Gas Steam Tables	27	1	28	22%
Total Electric Steam Tables	25	73	98	78%

In the Frontier Energy study, 52% of steam tables were gas-fired, but when those results are combined with this study only 22% were gas-fired. There were two (2) sites in this study that each had 30+ electric steam tables which skews the results. The Frontier Energy study found that buffet steam tables in the dining room were usually electric steam tables which was also the case in this study.

The rest of the results from the Frontier Energy ET study were based only upon the twenty-seven (27) gas-fired steam tables. Those results were compared to all of the steam tables from this study (gas and electric) since only one (1) steam table in this study was gas-fired.

Table 31: Other Steam Table Comparisons

	Frontier Energy ET Study (Gas-Fired Steam Tables only)	This Study
Efficient	30%	3%
Inefficient	70%	97%
Avg Number of Pans	4.7	3.9
Avg Op Hours/day	12.2	12.0

In this study, all but one (1) of the steam tables were wet-well which is the most inefficient design for both gas and electric. This indicates that inefficient wet-well steam tables might still be the most preferred type of steam table among both gas and electric models. The average number of pans per steam table and average number of operating hours per day were also similar between this study and the Frontier Energy ET study. These inputs are important for measure package calculations and this study supports those values.

Results & Discussion

The results for each selected EE CFS measure are discussed in their own section below.

Griddles

- Griddle distribution by restaurant type:

  It was found that FSR Casual Dining restaurants had the largest concentration of griddles. Within the FSR Casual dining subsector there are many large chain restaurants. Studies have shown that large chain customers have varying levels of staff involvement in the equipment selection process. In one case, the franchisees only selected from a short equipment list with a preference to lower cost items without considering energy cost. This was verified through customer surveys that revealed that target respondents with griddles were generally franchise owners that oversaw the equipment selection process, and they preferred lower first costs to encourage further EE upgrades.

- Energy Savings Potential:

  Using the 2021 PG Study (California Public Utilities Commission, 2021), the market size for griddles was estimated to 47,800 griddles. The market potential range is 81,989 therms/year to 1,806,840 therms/year. The low market potential value comes from the 2021 PG study with a market penetration of 0.4538%, and the high market potential value is using a market penetration rate of 10%.

- Measure package update to include a separate tier for high-efficiency griddles:

  According to the California Energy Wise Qualified Products List (California Energy Wise, 2022), the highest efficiency gas-fired griddles which only use gas (there are some gas-fired griddles that also use electricity) are 54% efficient while the rest of the griddles are between 38% to 47% efficient. There is an opportunity to offer higher incentives for the highest efficiency models by including Tier I/Tier II product categories in the existing measure package SWFS004. TRC comparison analysis was performed between the highest efficiency griddles against the average for all EE griddles included in the existing measure package. The TRC for the highest efficiency case increased to 2.89 compared to 2.42 for the overall measure package.

- Other Characteristics impacting the adoption for higher-efficiency griddles:
  - Many higher-efficiency griddles have thermostatic controls that allow precise control of surface temperature and variable temperatures across multiple zones. Customer survey respondents indicated that easy-to-control uniform

temperature distribution is an advantage because it allows for consistent cooking output.
- The advanced controls were found to be a barrier for one customer respondent, but not for others
- Fast cooking times are generally an advantage for market adoption
- One respondent thought the smaller design was an advantage because it made space for an additional fryer. However, the same respondent also thought the smaller design was a disadvantage because the griddle could not keep up with high demand periods
- Lightweight, low-height designs are ergonomic for operators and make them easy to maintain.
- Multiple burners in high-efficiency griddles increase reliability by allowing for a portion of the burners to fail without operational downtime.

Automatic Conveyor Broiler

- Automatic conveyor broilers are often used in large restaurant chains

  Automatic Conveyor Broilers offer the added convenience of an automated cooking process ideal for large restaurant chains that require high production capacity and consistent food quality. One manufacturer of automatic conveyor broilers targets high-volume burger restaurants utilizing digital controls and pre-programmed cook time settings to communicate directly with the point of sale (POS) system resulting in labor cost savings.

- Conveyor broiler marketing

  The utility representatives thought more work could be done with specific chain restaurants to see if they would switch to conveyor broilers. Some chain restaurants have investigated using conveyor broilers but have not decided to use them at this time. There has not been a lot of marketing for EE conveyor broilers, and there could be more done to market them. Automatic conveyor broilers have the highest TRC (7.8) of all foodservice measures from CEDARS meaning it could be advantageous to market them more heavily.

- Energy Savings Potential

  Using the 2021 PG Study (California Public Utilities Commission, 2021), the market size for automatic conveyor broilers was estimated to 1,747 conveyor broilers. The market potential range is 78,500 therms/year to 337,171 therms/year. The low market potential value comes from the 2021 PG study with a market penetration of 2.33% and the high market potential value is using a market penetration rate of 10%.

- Comparison of automatic conveyor broilers to underfired broilers and griddles

  SoCalGas utility representatives indicated that customers who don't use automatic conveyor broilers would use underfired broilers or griddles to cook the same food. There is an opportunity to investigate the relative energy usage per pound of product from a griddle and conveyor broiler to see which one consumes less energy.

- Other Characteristics impacting the adoption for automatic conveyor broilers
  - Automation of the automatic conveyor broiler and its ability to directly connect to a POS system reduces labor costs and makes the unit easy to use. This was the most significant advantage noted by the restaurant owners and managers surveyed.
  - Most restaurant owner/managers surveyed thought that the automatic conveyor broiler provides both high quality food output and increased food output which helps to dispel the misconception that energy efficiency is achieved at the expense of food quality or production capacity
  - Automatic conveyor broilers radiate less heat into the kitchen making the kitchen more comfortable and reducing the risk to operators for heat related illnesses
  - A few restaurant owners/managers noted that energy utility bill savings was an advantage of this equipment which means they are aware of the energy usage and are pleased with the results of the increased energy efficiency
  - These broilers do require additional preparation to use and also require more cleaning of their internal parts which can be cumbersome, but most restaurant owners/managers feel this has a negligible effect on the overall labor savings
  - A couple of restaurant managers indicated that their automatic conveyor broilers do not cook chicken filets on the first pass of the machine which indicates a need for customer education on properly calibrating equipment or selecting the right equipment for the food item being cooked
  - One manager surveyed mentioned issues with the conveyor broiler's ignitor and long lead times for replacement parts

Underfired Broiler

- Underfired Broiler Market

  The restaurant owner/manager survey respondents that have underfired broilers were primarily from independently owned restaurants. A 2018 broiler market evaluation (Southern California Gas Company, 2018) showed an overwhelmingly high participation rate from independent business owners, but there is still a significant number of small and large-chain restaurants with underfired broilers showing a potential for underfired broilers.

- Energy Savings Potential

  The 2021 PG Study did not include underfired broilers, so an alternative approach was used to estimate the market potential. The saturation rate of the appliances and ownership factors were used to estimate the market size of 17,914 broilers. The market potential range is 272,977 to 1,171,576 therms/year. The low market potential value is assumed to be the same as the automatic conveyor broiler value from the 2021 PG study with a market penetration of 2.33% and the high market potential value is using a market penetration rate of 10%.

- Underfired broiler cost analysis needed

  The highest efficiency broiler models are much more efficient than the others qualified for incentives in the California Energy Wise EE program. The underfired broiler measure package SWFS019 was used to check for opportunities for a Tier I/Tier II measure package. The highest efficiency broiler performs significantly better than the other qualified broilers, however, the customer ROI is higher due to the increased costs (and the TRC is lower for the same reason). Costs were not available for the 3.5-foot broiler unit, and (if included) may decrease overall average cost making the case for a Tier I/Tier II measure package revision.

- Other Characteristics impacting the adoption for automatic conveyor broilers
  - There is a perception that EE underfired broilers reduce food quality. This perception was primarily the result of the impression that more efficient burners could result in lower heating capacity and longer cooking times. However, all restaurant owner/manager survey respondents reported high food quality output and noted uniform cooking and lack of flare-ups because there are no open-flames.
  - All restaurant owner/manager respondents indicated that their EE underfired broiler is easy to use.
  - The EE underfired broiler also radiates less heat into the kitchen resulting in a more comfortable kitchen environment and less risk of operator heat illness.
  - Two (2) restaurant owner/manager respondents noted that the EE underfired broilers have longer cooking times and a long warm-up period, but a different respondent indicated that it has faster cooking times. This means selecting the appropriate broiler for the application is of utmost importance.
  - Several restaurant owners/managers said a disadvantage was the high upfront costs for the EE underfired broilers. One EE underfired broiler (of the highest efficiency) was found to cost $15k vs. others on the QPL that were $4k-$7k.

Steam Tables

- Steam table market

  The market literature review supported considering steam tables for further studies and/or ET pilot tests. The EE steam tables have potential to significantly reduce energy consumption given that the efficient units can save at least $300/year. Another study shows that more than 70% of steam tables in the market are low efficiency (Frontier Energy, 2020).

- Steam table market potential

  There were no claimed savings for steam table measures from 2017-2021, thus, no net therms or installation was calculated from the statewide claims data. The market potential was calculated using the ET study by Frontier Energy (Frontier Energy, 2020). The market size is 13,335 steam tables, and the average savings is 649 therms/year. The market potential range is 432,721 to 865,442 therms/year. The market penetration rates are 5% and 10%, respectively.

- Steam table measure package feedback

  A measure package was created for steam tables based off a study by Frontier Energy (Frontier Energy, 2020). However, the CPUC provided feedback indicating that additional information is needed to strength the measure offering, including

  - Market research to determine key operating parameters and market share statistics
  - Additional field and/or lab testing to increase the data set size
  - Research to establish the industry standard practice and qualifying steam table attributes.

- Findings from this study

  This study gathered some additional information on steam tables during restaurant owner/manager surveys to determine if this additional work is worth undertaking.

  - Dry-well steam tables provide reduced water costs and more uniform temperature distribution which prevents food from burning or from dropping below required temperatures, and these act as a strong driver for dry-well steam tables over wet-well steam tables.
  - The Study Team was only able to contact six (6) restaurant owners/managers who had steam tables and five (5) out of six (6) of them have electric steam tables.
  - When the results from the Frontier Energy study are combined with the results from this study 22% of the overall steam tables are gas-fired and the rest are electric

- The Frontier Energy study found that 70% of the gas-fired steam tables were inefficient wet-well configurations and this study found that 97% of the steam tables were inefficient wet-well configurations (gas-fired and electric combined). If the proliferation of wet-well steam tables holds true for both gas and electric, there is a good opportunity for savings for both electric and gas-fired steam tables.
- The average number of pans in the Frontier Energy study and this study are similar: 4.7 pans and 3.9 pans, respectively
- The average number of operating hours per day in the Frontier Energy Study and this study are similar: 12.2 hours/day and 12.0 hours/day, respectively

Market Barriers

A market barrier literature review was conducted to identify known market barriers. Later, SME interviews and restaurant owner/manager interviews were conducted to confirm/deny those barriers and uncover others.

- The top barriers are:
  - High Upfront Cost of EE CFS Equipment: This had the highest overall score from the SME interviews and restaurant owners/managers also mentioned it as a significant disadvantage for underfired broilers. Most SME respondents agreed that customers are unaware of the high ROIs achieved with EE foodservice equipment, and all respondents confirmed that customer decisions are usually made in the short-term, typically when equipment fails, and only large foodservice chains account for the ROI. Only 21% of the total survey respondents tracked their energy performance. One restaurant manager surveyed said the restaurant owner would be much more interested in EE CFS technologies if cost savings could be quantified before purchasing. Another restaurant owner surveyed said that cost-effectiveness is the most important factor in deciding whether to choose high efficiency CFS equipment. There is an opportunity to provide tools to restaurant decision-makers to quantify expected utility cost savings to help make the case for the higher up-front costs of EE CFS equipment. There is also an opportunity to include a way for restaurant owners to track energy use after they purchase their EE CFS equipment.
  - Current Supply-Chain Issues: This had the second-highest score from the SME interviews and refers to current supply-chain issues that have come up since the COVID-19 pandemic. One underfired broiler restaurant manager indicated they were having difficulties getting replacement parts due to supply chain issues as well.
  - Lack of Awareness of EE CFS products: This had the third-highest score from the SME interviews. However, the restaurant owner/manager interviews revealed

many advantages of EE CFS products other than the energy saving that could be leveraged to increase awareness and create more buy-in for these technologies

- Fragmented market making it hard-to-reach is a barrier, but not a top barrier

  This was found to be a barrier during the literature review. After SME interviews were completed, this was found to be a barrier, but it was not a strong barrier. Some SMEs scored this high (4 or 5) and some scored it low (2 or 2.5). It was found during the market barrier literature review that manufacturers concentrate more effort on large chains which was confirmed by some SMEs. However, other SMEs who scored this barrier low said that manufacturers have marketing strategies to reach all potential customers in chains, institutions, and independent restaurants.

- Lack of readily available EE CFS supply is a barrier, but not a top barrier

  This was also found to be a barrier after SME interviews were completed, but not a strong one and there was some disagreement about it. One SME scored this as a 5 and indicated that suppliers focus on stocking minimum efficiency equipment, but another SME scored this as a 1 and indicated suppliers could meet the demand for high-efficiency equipment if necessary. One manufacturer did not consider this to be a barrier because they only manufacture made-to-order equipment and can manufacture it without long lead times.

- There is still a misconception that energy efficiency is achieved at the cost of equipment performance, but this might be changing

  Several SME respondents indicated that this is still a barrier. However, the average score of this question (3.3) was not in the top ten (10) out of seventeen (17) total barriers and its average CV was 0.4 showing widespread disagreement. This high CV could mean that opinions in the CFS market about performance and energy efficiency are changing. Technology-specific studies reviewed during the literature review indicated that customers reported increased productivity at a lower energy usage which was consistent with the findings during the restaurant owner/manager survey. A common advantage for the restaurant owner/manager interviews was faster cooking times/more production and high-quality food across all three (3) existing high priority EE CFS technologies. There were a handful of respondents who noted slower cooking times or less production output, and these could contribute to this misconception. There is an opportunity to leverage positive restaurant owner/manager experiences to change the opinions in the CFS market. This may also indicate that more education is needed to ensure restaurant owners are selecting the right equipment for their operation, so they do not have issues with cooking output or quality.

- Additional maintenance and maintenance personnel training

  Some EE CFS technologies require additional maintenance like the automatic conveyor broiler or technologies with advanced burner designs. Overall, additional maintenance or improper maintenance questions scored between 3.0 and 4.0 indicating they are barriers but not strong barriers. The main takeaway from the SME interviews is that operators need to be adequately trained on controls and maintenance and also that there is an urgency for more qualified technicians for EE CFS equipment. Experienced technicians are not familiar with most EE CFS technologies, so there is a growing need for a newly educated technician workforce that can meet the growing demand for servicing for these high-priority CFS technologies.

- End-users may be more comfortable with advanced controls.

  Some SME respondents felt a lack of operator training was a strong barrier and others felt it was not a barrier. Only one (1) restaurant owner/manager surveyed noted issues with controls as a disadvantage. This indicates that advanced controls can still be a barrier, but operators may be more comfortable working with the controls as more EE CFS equipment has entered the market over the years. Additionally, advanced controls can be a driver for large chains that can take advantage of them.

- Payback periods may be a barrier

  Restaurant owners prefer ROIs of 1-2 years due to the high turnover rate of businesses in the CFS sector. Therefore, if ROI on a piece of equipment is greater than 2 years, the upgrade to EE CFS equipment may not be made unless the owner is making the upgrade to gain an additional benefit offered by the EE CFS equipment.

Market Drivers

- The top drivers are
  - Improved Performance: This had the highest overall score from the SME interviews and many restaurant owners/managers mentioned improved performance as an advantage in the form of higher quality food, faster cooking times, or more production capacity.
  - Labor Savings: This had the second-highest overall score from the SME interviews, but the technical expert/utility rep group thought this was the most important driver. Restaurant owner/manager respondents with automatic conveyor broilers specifically noted labor savings as an advantage.

  - Consolidating kitchen operations: Consolidating kitchen operations leads to increased sales. This had the third-highest overall score from the SME interviews. The distributors and manufacturers ranked this as the second-highest driver while the technical experts and utility reps ranked it as the fourth-highest. One restaurant manager who had an EE CFS griddle noted that the smaller griddle had allowed for the installation of an additional fryer in the kitchen.

- Independent verification of performance is a top driver among distributors and manufacturers

  Distributors and manufacturers ranked this driver as the third-highest driver and equipment must have independent verification of performance to be on the California Energy Wise Instant Rebates Qualified Products List.

- Easy Installation/Plug-and-play equipment is a top driver among technical experts and utility reps

  Technical experts and utility reps ranked this as the third-highest driver. However, many manufacturers said that most EE CFS equipment is already plug and play.

- The many advantages found for the three (3) existing EE CFS technologies may also act as drivers.

  Overall, the restaurant owners/managers interviewed were satisfied with their EE CFS equipment and listed many advantages including:

  - Faster cooking times
  - Increased food output
  - High quality food output
  - Easy to use/easy to control
  - Uniform temperature distribution
  - More ergonomic for operators
  - Easier to maintain
  - Increased reliability
  - Reduced labor costs
  - Less heat radiated into kitchens/less operator discomfort or risk of heat illness

Conclusions & Recommendations

- Further testing of EE CFS technologies to quantify other advantages and disseminate to the CFS market via outreach event or marketing tools

  There appears to be potential to increase the participation of the three (3) existing EE CFS technologies in the California market. In order to increase participation, further testing is recommended for all three (3) technologies to focus on quantifying other advantages of the EE CFS equipment such as:

- Better control over temperature set points
- Reduced cook-times
- Customer opinion of higher food quality
- More ergonomic design
- Increased food output capacity
- Reduced heat input to the kitchen from the EE CFS equipment
- Labor savings

The results of this testing would go into marketing materials or outreach events with customer testimonials to show foodservice customers additional benefits of EE CFS products. This would address many of the market barriers that were found during this study and previous studies.

- Consider Development of a Cost Savings Tool

- It is recommended that a cost savings tool be developed for each of the high-priority EE CFS measures that calculates customer ROI based upon the expected energy cost savings and life of the equipment as this was a suggestion from one of the restaurant owner/manager respondents. This could also include a component for restaurant owners to track their energy savings after EE equipment purchase since only 21% of those surveyed did track energy consumption. Additionally, this tool can highlight the other advantages of EE CFS equipment mentioned above.

- Customer Education and Workforce Training

  Customer education is needed to further dispel the notion that high efficiency comes at the cost of performance, and to educate customers on how to select the right equipment for their kitchen operation. Additionally, EE CFS workforce training is needed to ensure the workforce can maintain the EE CFS equipment which has more advanced controls. It is recommended that the results about customer education and workforce training needs be communicated to the appropriate groups to address.

- Initiate a measure package revision for griddles

  It is also recommended that a Tier I/Tier II measure package revision be initiated for griddles so a higher incentive could be offered, and more energy savings claimed for the 54% efficient products.

- Cost analysis on highest efficiency underfired broilers

  Outreach to the manufacturer of the highest efficiency broilers should be done to get better cost data to confirm if a Tier I/Tier II approach to this measure package would be advantageous or not. Cost data was missing for some of the most efficient

under-fired broilers, and the inclusion of this could reduce the overall cost resulting in a better customer ROI and better measure TRC.

- Quantify relative energy per pound of product from griddle, underfired broiler, and conveyor broiler

  SoCalGas utility representatives indicated that if customers do not have broilers, they must use griddles. There is an opportunity to quantify the relative energy per pound of product from using a griddle or underfired broiler to a conveyor broiler. It is recommended that a comparison study be done comparing the energy per pound of product and cost (upfront and ongoing) of product for griddles, underfired broilers, and conveyor broilers.

- Quantify relative energy and emissions per pound of product from electric and gas-fired EE CFS technologies

  Electric and gas-fired EE CFS equipment on the QPL is tested against the same standards and lists an hourly production capacity. It is recommended that a study be initiated to compare electric CFS equipment to gas-fired CFS equipment to compare the source energy, source emissions, and cost per pound of food cooked.

- Perform a steam table market assessment

  It is recommended that a more thorough steam table market assessment be completed in order to determine the existing share of custom/manufactured, dry-well/wet-well, and electric/gas steam tables and determine key operating parameters. The data gained from this study was limited due to the outreach methods used, but the data suggest that the inefficient wet-well steam tables may have a large market share. This would address part of the CPUC's requirements to reinforce the measure package, and a determination of whether to go ahead with field studies or lab testing could be made at that point.

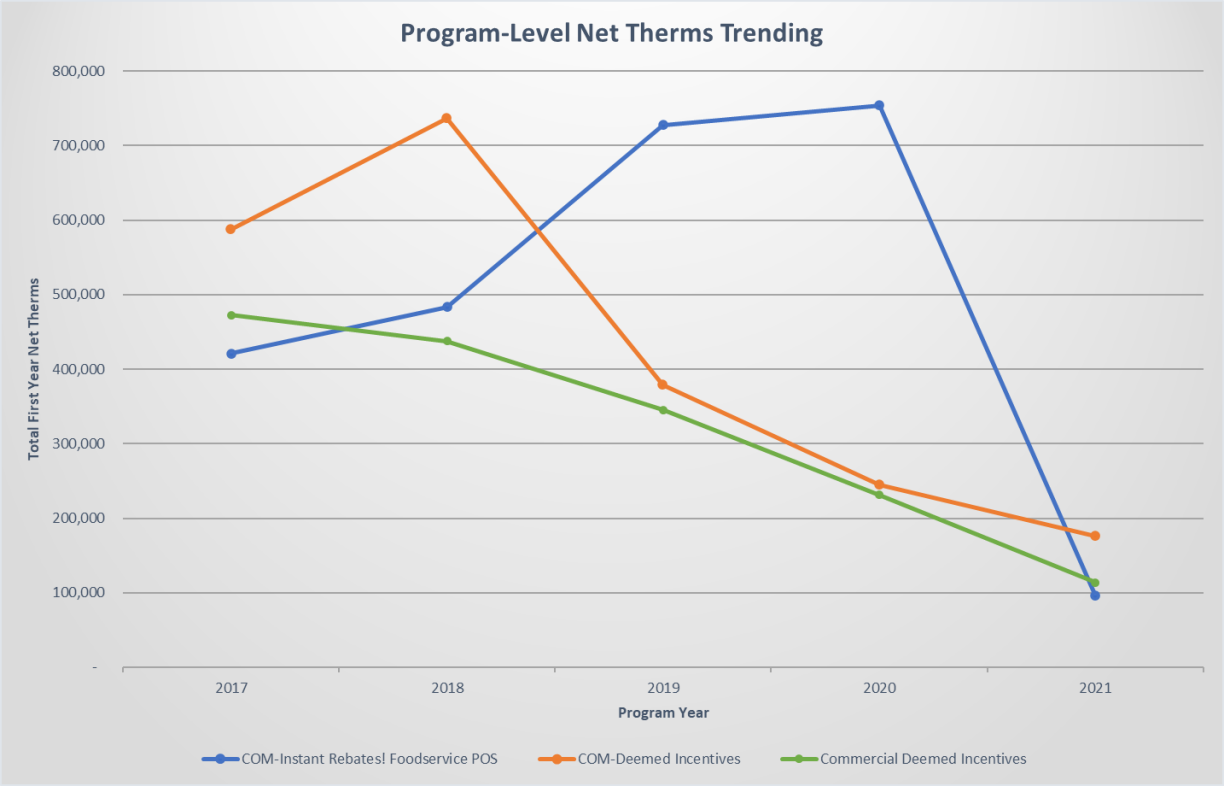
Appendices

Appendix I. Program-Level Installation Trends

Table 32: Yearly Net Installations by Program

	Installations					
Program Name	2017	2018	2019	2020	2021	Total
COM-Instant Rebates! Foodservice POS	938	1,215	1,637	1,904	299	5,993
Commercial Deemed Incentives	1,915	1,482	832	840	259	5,328
COM-Deemed Incentives	1,413	1,767	764	713	614	5,271
COM-Direct Install Program	125	1,281	1,755	1,533	7	4,701
Hospitality Program	1	2,303	1	-	-	2,305
PUB-Deemed Incentives	-	-	170	6	3	179
SW-COM-Deemed Incentives-Commercial Rebates	45	28	10	29	-	112
COM-Calculated Incentives	54	15	-	-	1	70
School Energy Efficiency	2	14	18	23	-	57
Commercial Large Customer Services (>20KW) Program	-	-	-	-	13	13
Industrial Strategic Energy Management	-	-	-	-	-	-
Total	4,493	8,105	5,187	5,048	1,196	

Figure 11: Program-Level Net Installation Trends 2017-2021



Appendix II. SME Raw Survey Responses

Respondent #1

1.1. How much of a driver is commissary kitchen services?

1	2	3	**4**	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	4	**5**

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	**2**	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	**4**	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	**4**	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	**3**	4	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	**2**	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	**4**	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	**4**	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	**3**	4	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	**4**	**5**

1.12. How much of a driver is government support for technology uptake?

1	2	**3**	**4**	5

1.13. How much of a driver is independent verification of performance?

1	2	**3**	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	**3**	**4**	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	**4**	**5**

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	**4**	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	**4**	**5**

1.18. How much of a barrier is the increased up-front cost?

1	2	**3**	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	**4**	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	**4**	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	**5**

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	**4**	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	**4**	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	**2**	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	**3**	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	**5**

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	**3**	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	**5**

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	3	**4**	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	**5**

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	**5**

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	**5**

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	**4**	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #2

1.1. How much of a driver is commissary kitchen services?

1	**2**	**3**	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	4	**5**

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	**2**	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	4	**5**

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	**2**	3	4	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	**3**	4	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	**2**	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	**4**	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	**5**

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	4	**5**

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	**3**	4	5

1.12. How much of a driver is government support for technology uptake?

1	**2**	3	4	5

1.13. How much of a driver is independent verification of performance?

1	2	3	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	5

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #3

1.1. How much of a driver is commissary kitchen services?

1	2	3	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	4	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	2	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	4	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	4	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	4	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	2	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	**4**	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	**3**	4	5

1.12. How much of a driver is government support for technology uptake?

1	2	**3**	4	5

1.13. How much of a driver is independent verification of performance?

1	2	**3**	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	**3**	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	**5**

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	**3**	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	**4**	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	**5**

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	**2**	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	**2**	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	**2**	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	**3**	4	5

1.23. How much of a barrier is the lack of awareness?

1	**2**	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	**4**	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	**3**	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	**4**	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	**2**	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	**3**	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	**2**	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	**3**	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	**4**	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	**2**	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	**2**	3	4	5

Respondent #4

1.1. How much of a driver is commissary kitchen services?

1	**2**	3	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	**4**	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	**2**	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	**3**	4	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	**4**	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	**4**	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	2	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	4	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	4	5

1.12. How much of a driver is government support for technology uptake?

1	2	3	4	5

1.13. How much of a driver is independent verification of performance?

1	2	3	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	5

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #5

1.1. How much of a driver is commissary kitchen services?

1	2	3	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	4	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	2	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	4	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	4	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	4	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	2	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	4	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	4	5

1.12. How much of a driver is government support for technology uptake?

1	2	3	4	5

1.13. How much of a driver is independent verification of performance?

1	2	3	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	5

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #6

1.1. How much of a driver is commissary kitchen services?

1	2	**3**	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	4	**5**

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	2	**3**	**4**	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	**4**	**5**

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	**4**	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	4	**5**

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	**2**	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	**2**	3	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	**5**

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	**4**	**5**

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	**4**	5

1.12. How much of a driver is government support for technology uptake?

1	2	3	**4**	5

1.13. How much of a driver is independent verification of performance?

1	2	3	**4**	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	**4**	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	**5**

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	**5**

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	**4**	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	**3**	4	5

Respondent #7

1.1. How much of a driver is commissary kitchen services?

1	2	**3**	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	**4**	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	2	**3**	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	4	**5**

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	**4**	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	**3**	4	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	2	**3**	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	**3**	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	**4**	**5**

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	**4**	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	**3**	4	5

1.12. How much of a driver is government support for technology uptake?

1	2	**3**	**4**	5

1.13. How much of a driver is independent verification of performance?

1	2	**3**	**4**	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	**2**	3	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	**4**	5

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	**3**	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	**4**	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	**5**

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	**4**	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	**5**

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	**5**

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	**4**	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	**5**

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	**4**	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	**3**	**4**	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	**5**

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	**4**	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	**2**	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	**2**	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #8

1.1. How much of a driver is commissary kitchen services?

1	2	3	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	4	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	2	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	3	4	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	4	5

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	4	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	2	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	4	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	4	5

1.12. How much of a driver is government support for technology uptake?

1	2	3	4	5

1.13. How much of a driver is independent verification of performance?

1	2	3	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	5

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	**2**	3	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	**2**	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	**2**	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	**3**	**4**	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	**5**

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	**2**	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #9

1.1. How much of a driver is commissary kitchen services?

1	2	**3**	4	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	**4**	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	2	**3**	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	**3**	4	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	4	**5**

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	4	**5**

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	2	3	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	3	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	4	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	4	5

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	4	5

1.12. How much of a driver is government support for technology uptake?

1	2	3	4	5

1.13. How much of a driver is independent verification of performance?

1	2	3	4	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	4	5

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	5

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	5

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	4	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	5

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	**4**	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	**2**	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	**2**	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	4	**5**

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	**5**

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	**2**	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	**2**	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Respondent #10

1.1. How much of a driver is commissary kitchen services?

1	2	3	**4**	5

1.2. How much of a driver is consolidating kitchen operations to offer additional products?

1	2	3	**4**	5

1.3. How much of a driver is the customer's willingness to reduce dependence on fossil fuels?

1	**2**	3	4	5

1.4. How much of a driver is the compliance with environmental/worker safety regulations?

1	2	**3**	4	5

1.5. How much of a driver are easy installations, or plug-n-play type situations?

1	2	3	4	**5**

1.6. How much of a driver are new or advanced features for the end-user?

1	2	3	**4**	5

1.7. How much of a driver is the recyclability of emerging foodservice equipment?

1	**2**	**3**	4	5

1.8. How much of a driver is local manufacturing or production to the end-user?

1	2	**3**	4	5

1.9. How much of a driver is improved performance for the end-user?

1	2	3	**4**	5

1.10. How much of a driver is the customer's incentive to save on energy operation?

1	2	3	**4**	**5**

1.11. How much of a driver is the customer's willingness to pay a premium for a better product?

1	2	3	**4**	5

1.12. How much of a driver is government support for technology uptake?

1	2	3	4	**5**

1.13. How much of a driver is independent verification of performance?

1	2	3	**4**	5

1.14. How much of a driver is a shorter-to-market cycle when entering the market?

1	2	3	4	**5**

1.15. How much of a driver is labor savings from using new EE equipment?

1	2	3	4	**5**

1.16. How much of a driver for steam tables is to maintain food at the ideal temperatures?

1	2	3	4	5

1.17. How much of a driver are the added advantages of dry-well vs. wet-well steam tables?

1	2	3	4	5

1.18. How much of a barrier is the increased up-front cost?

1	2	3	4	**5**

1.19. How much of a barrier are Hard-to-Reach or Fragmented foodservice markets?

1	2	3	**4**	5

1.20. How much of a barrier is the lack of readily available EE foodservice equipment?

1	2	3	4	**5**

1.21. How much of a barrier are current supply-chain issues?

1	2	3	4	5

1.22. How much of a barrier are adverse gas regulatory environments?

1	2	3	4	5

1.23. How much of a barrier is the lack of awareness?

1	2	3	4	5

1.24. How much of a barrier is the misconception that EE is achieved at the cost of performance?

1	2	3	4	5

1.25. How much of a barrier is the uncertainty in stated performance?

1	2	3	4	5

1.26. How much of a barrier is the considerable variation in unit pricing?

1	2	3	4	5

1.27. How much of a barrier is higher lifecycle costs to the end user?

1	2	3	4	5

1.28. How much of a barrier is the end user's lack of awareness of GHG savings?

1	2	3	4	5

1.29. How much of a barrier is the uncertainty of future foodservice codes/standards?

1	2	3	4	5

1.30. How much of a barrier is the lack of employee/operator training?

1	2	3	4	5

1.31. How much of a barrier is the lack of maintenance personnel?

1	2	3	4	5

1.32. How much of a barrier is improper maintenance of advanced EE equipment?

1	2	3	4	5

1.33. How much of a barrier is added maintenance with conveyor vs. underfired broilers?

1	2	3	4	5

1.34. How much of a barrier is the improper operation of multi-functional equipment?

1	2	3	4	5

Appendix III. Raw Restaurant Owner/Manager Survey Responses

Respondent #1

Equipment Type: Automatic Conveyor Broiler
Restaurant Type: QSR/Fast Food
Interviewee Role/Position: Manager
Type of Cuisine: Pizzeria
Operating Days per Week: 7
Operating Hours per Day: 10 (10am-8pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Great performance.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - They favor automation that helps reduce labor and increase output.
   - What is the most significant disadvantage of the new equipment upgrade?
   - Prep and cleaning are cumbersome, but manageable.
8. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Prep/cleaning cumbersome, but still recommends based on automation.
9. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

   - Very likely if there are good deals on new technology from rebates.
10. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Favors high-tech equipment. Will upgrade if technology helps business.

Respondent #2

Restaurant Type: QSR, Fast Food
Interviewee Role/Position: Owner
Type of Cuisine: American Burger
Operating Days per Week: 7
Operating Hours per Day: 11 (11am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Saves money by reducing gas utility bills.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the biggest advantage of the new equipment upgrade?
   - Saving money on energy bills.
8. What is the biggest disadvantage of the new equipment upgrade?
   - Nothing to think of.
9. How likely are you to recommend this equipment to others and why?

1	2	3	4	5

   - Very likely to recommend. Great performance.
10. How likely are you to adopt other EE equipment for your operations and why?

1	2	3	4	5

    - If it works the same or better, and good for the environment.
11. What is the one factor that will influence your decision to increase adoption of more EE equipment?
    - Again, save money on energy utility bills.

Respondent #3

Equipment Type: Automatic Conveyor Broiler
Restaurant Type: QSR, Fast Food
Interviewee Role/Position: Owner
Type of Cuisine: American Burger
Operating Days per Week: 7
Operating Hours per Day: 16 (7am-11pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Saves money by reducing gas utility bills.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Works properly, no issues. But cannot speak on behalf of the operators.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Up-front costs from the perspective of a business owner.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Favors energy efficiency.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Favors saving energy.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Again, save money on energy utility bills.

Respondent #4

Equipment Type: Automatic Conveyor Broiler
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Cook
Type of Cuisine: Middle Eastern
Operating Days per Week: 7
Operating Hours per Day: 12 (11am-11pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Does not always cook chicken with one-pass through the conveyor.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Savings money on energy bills.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Operator training to ensure food doneness (specifically chicken). But extra labor is negligible as it does not affect overall operations.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Favors automation regardless of other issues. Consistent performance.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Cannot speak on behalf of the owner, but very likely if it saves more money.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Quantifying dollar amounts for rebates would incentivize owner to increase adoption.

Respondent #5

Equipment Type: Automatic Conveyor Broiler
Restaurant Type: Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 6 (Tues-Sun)
Operating Hours per Day: 11 (11am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Saves on gas energy and cost.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Does not radiate heat into cooking space. Good for operators.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Ignitor mechanism and possible flame sensor faulty. Sometimes doesn't ignite.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Saving money.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Save money and better for the operators.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Cost and energy savings.

Respondent #6

Equipment Type: Automatic Conveyor Broiler
Restaurant Type: Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 11 (11am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Sometimes has issues. Long-lead time for replacement parts.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Easy to use. Very helpful for cooking burgers.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Replacement parts take very long time to receive and replace.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Again, the maintenance and repair are an issue due to complexity and lead time.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

   - They like the new technology, as it is easy-to-use when fully operational.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
   - Saving energy, thus, reducing costs.

Respondent #7

Equipment Type: Automatic Conveyor Broiler
Restaurant Type: QSR, Fast Food
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 11.5 (11am-9/10/11pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Does not cook the chicken completely with one-pass thru auto broiler.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

   - Third party monitors energy consumption and coordinates with corporate.
5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Provides strong cooking power allowing for fast cook times.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Cumbersome maintenance and cleaning.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Performs very well. Meets expectations.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Cannot speak on behalf of corporate, but suggested it is very likely to save money.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Corporate make the decision to upgrade. Will not speak on behalf of corporate.

Respondent #8

Equipment Type: Griddle
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 12 (10am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Very efficient, quick operation.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Heats up very fast.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Complicated controls.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Quick operation.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Helps a lot with operations.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Needs to help speed of operations.

Respondent #9

Equipment Type: Griddle
Restaurant Type: Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 6 (Tues-Sun)
Operating Hours per Day: 10 (11am-9pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Low cost and ease of operation. Cooks' food with better quality.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Quality of the food.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None to think of.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Low cost from rebates.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

   - Increase food quality.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
   - Going green and sustainability.

Respondent #10

Equipment Type: Griddle
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 11.5 (10:30am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Saves energy and money.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Quicker response for controlling temperature.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Quick operation.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Further save on energy and money.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Saving money.

Respondent #11

Equipment Type: Griddle
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 11.5 (10:30am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Low cost due to rebates.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Easy to control temperature.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Quick operation. Heats up quickly.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Further save on energy.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Energy savings.

Respondent #12

Equipment Type: Griddle
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 12.5 (10:30am-11pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Uniform temperature for cooking.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Uniform temperature allows for consistent cooking.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Reliable, consistent cooking experience.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

   - Very likely if new equipment has consistent performance.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
   - Lower upfront cost.

Respondent #13

Equipment Type: Griddle
Restaurant Type: Casual Dining
Interviewee Role/Position: Assistant Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 10.5 (11am-9:30pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Performs very well, with no issues.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Operators really like the new equipment. No issues were reported. Efficient operations.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Nothing to think of.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Good performance, reliable. No issues, smooth operations.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Anything that helps save money is very likely.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Lower upfront cost.

Respondent #14

Equipment Type: Griddle
Restaurant Type: QSR, Fast Food
Interviewee Role/Position: Owner
Type of Cuisine: American Burger
Operating Days per Week: 7
Operating Hours per Day: 11 (11am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Multiple burners are more reliable. Previous industry standards had unreliable single-burner technology that often failed. No backup burners.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

   - Difficult to track energy change as utility rates have continuously changed over the last few years with the pandemic. Fluctuations of cost and gas rise in price.
5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

   - One-switch operation making it easy to use.
7. What is the most significant advantage of the new equipment upgrade?
   - Ergonomic for operators. Good for workers. Easy to work with. Low height and larger drip pans make it easy to operate. A lighter weight is easy to clean.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Doesn't have a rear removable indicator. Hard to clean the back of the griddle as cooks have to reach over the griddle to clean it. They have zones marked off with indicators for specific foods to increase efficiency.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Performance. Provides top-quality food.

10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

- Anything to help lower cost.

11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Cost-effectiveness.

Respondent #15

Equipment Type: Griddle
Restaurant Type: Casual Dining
Interviewee Role/Position: Owner
Type of Cuisine: Mediterranean
Operating Days per Week: 7
Operating Hours per Day: 7.5 (7:30am-3pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Both griddle and broiler larger capacity. Cooks food faster replacing smaller capacity models.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Cooks food faster.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Cooks food faster.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Already going to upgrade oven. Expected to help cook food faster.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Increase production output.

Respondent #16

Equipment Type: Griddle
Restaurant Type: QSR, Fast Food
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 18 (9am-3am)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - They prefer the previous griddle claiming new griddle is not large enough. However, corporate is the decision-maker.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Smaller design allows room for additional fryer (goal of the upgrade).
8. What is the most significant disadvantage of the new equipment upgrade?
   - Small size results in less efficient operations. Manager disagrees with upgrade.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Hard to meet food demand with smaller griddle. Previous griddle more powerful.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Corporate favors equipment upgrades that save space.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Needs to cook the food faster to meet demand (manage

Respondent #17

Equipment Type: Underfired Broiler
Restaurant Type: QSR / Fast Food
Interviewee Role/Position: Kitchen Manager
Type of Cuisine: Mexican
Operating Days per Week: 6 (closed Mon)
Operating Hours per Day: 9 (11am-8pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Does not cook fast enough. Gas takes time to heat up.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Save money.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Slow operation. Not Efficient enough for food production during rushes.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Saving money is most important.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Cannot speak on behalf of management but suggest very likely if it helps save money.
11. What is the one factor that will influence your decision to increase adoption of more EE equipment?
    - Saving money.

Respondent #18

Equipment Type: Underfired Broiler
Restaurant Type: QSR / Fast Food
Interviewee Role/Position: Manager
Type of Cuisine: Pizzeria
Operating Days per Week: 7
Operating Hours per Day: 11 (11am-12am)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Great performance.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Looks good and performs very well.
   - What is the most significant disadvantage of the new equipment upgrade?
   - High upfront cost.
8. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - High quality product. Cooks the food with high-quality.
9. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

   - If there are good rebates, the owner will consider more upgrades.
10. What is the one factor that will influence your decision to increase adoption of more EE equipment?
    - Lower upfront cost.

Respondent #19

Equipment Type: Underfired Broiler
Restaurant Type: QSR/Fast Food
Interviewee Role/Position: Owner
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 16 (6am-10pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Saves money.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Cooks faster.
8. What is the most significant disadvantage of the new equipment upgrade?
   - High cost.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Fast cooking, but high costs.
10. How likely are you to adopt other EE equipment for your operations and why?

1	2	3	4	5

    - Upgrades are done every year taking advantage of rebates.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Lower costs via rebates.

Respondent #20

Equipment Type: Underfired Broiler
Restaurant Type: Casual Dining
Interviewee Role/Position: Owner
Type of Cuisine: Mediterranean
Operating Days per Week: 7
Operating Hours per Day: 7.5 (7:30am-3pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Both griddle and broiler larger capacity. Cooks food faster replacing smaller capacity models.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Cooks food faster.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Cooks food faster.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Already going to upgrade oven. Expected to help cook food faster.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Increase production output.

Respondent #21

Equipment Type: Underfired Broiler
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Owner
Type of Cuisine: American
Operating Days per Week: 5 (Tues-Sat)
Operating Hours per Day: 8 (12pm-8pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Lower energy costs. Owner does not any increases in utility bills.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

   - Only operatable for 30 days, so tracking, yet. Owner plans to track later.
5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Quality food cooking with efficient gas burning with less wasted energy.
8. What is the most significant advantage of the new equipment upgrade?
   - Cannot think of any disadvantages.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Energy efficient, which is good for the environment.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

   - He is willing to adopt more EE equipment if it helps save more money.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
   - Compliance with city ordinances.

Respondent #22

Equipment Type: Underfired Broiler
Restaurant Type: Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: Brazilian
Operating Days per Week: 6 (Wed-Mon)
Operating Hours per Day: 8.5 (Average over the week)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Cooks food evenly, good quality.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Easy to control temperature.
8. What is the most significant disadvantage of the new equipment upgrade?
   - Takes time to heat up in the beginning of operations.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Easy to operate and cook food quickly.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Maintain high food quality.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Low cost.

Respondent #23

Equipment Type: Underfired Broiler
Restaurant Type: Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: Italian
Operating Days per Week: 6 (closed Mon)
Operating Hours per Day: 10 (11am-9pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Cooks very efficiently, and evenly distributed heat.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Cooks evenly, with no open flame.
8. What is the most significant disadvantage of the new equipment upgrade?
   - None.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - Works very well, ease of cooking with no open flame.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - Smaller environmental footprint.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Makes other cooking process easier.

Respondent #24

Equipment Type: Underfired Broiler
Restaurant Type: Catering
Interviewee Role/Position: Owner
Type of Cuisine: Middle Eastern
Operating Days per Week: 5 (Mon-Fri)
Operating Hours per Day: 8 (8am-5pm)

1. How happy are you with the energy efficiency upgrade experience?

1	2	3	4	5

2. What one factor influenced that score? Please explain.
   - Cooks tell owner the equipment performs very well all around.
3. How happy are you with equipment performance vs. stated performance?

1	2	3	4	5

4. Have you tracked your energy consumption data before and after the upgrade?

Yes	No

5. If yes, please rate the energy performance on a scale from 1-5?

1	2	3	4	5

6. How happy are you with the cooking experience with the new equipment?

1	2	3	4	5

7. What is the most significant advantage of the new equipment upgrade?
   - Owner needs to get more feedback from cooks, cannot answer this definitely.
8. What is the most significant advantage of the new equipment upgrade?
   - Owner needs to get more feedback from cooks, cannot answer this definitely.
9. How likely are you to recommend this equipment to others, and why?

1	2	3	4	5

   - No issues reported by cooks. So, he would highly recommend to others.
10. How likely are you to adopt other EE equipment for your operations, and why?

1	2	3	4	5

    - He is willing to adopt more EE equipment if it helps save more money.
11. What is the one factor that would influence your decision to increase the adoption of more EE equipment?
    - Saving money.

Respondent #25

Equipment Type: Steam Table
Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Cook
Type of Cuisine: Middle Eastern
Operating Days per Week: 7
Operating Hours per Day: 12 (11am-11pm)

1. Do you have steam tables?

Yes	No

2. How many?
   - 2
3. Number of pans for each steam table?
   - 2
4. Is the steam table a wet or dry-well configuration?

Wet-well	Dry-well

5. Is the steam table electric or gas?

Electric	Gas

6. Is it custom-made or off-the-shelf?

Custom	Off-the-Shelf

7. Do you use lids for the steam table pans?

Yes	No

8. How are the burners controlled? (knob, electric set point/other)
   - Electronic Set-Point
9. Do you know the burner rating, or heating capacity in Btu/hr. or Watts, if electric?

Yes	No

10. If yes, please provide the rating in Btu/hr. or Watts, if electric?
    - N/A
11. What types of foods are heated in the pans?
    - Chicken, sauces, anything that need to stay heated throughout service.
12. Days of operation:
    - 7 days
13. Operating hours per week:
    - 12 hours
14. Steam Table Location:
    - Kitchen

Respondent #26

Equipment Type: Steam Table
Restaurant Type: Casual Dining
Interviewee Role/Position: Assistant Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 10.5 (11am-9:30pm)

1. Do you have steam tables?

Yes	No

2. How many?
   - 2
3. Number of pans for each steam table?
   - 4
4. Is the steam table a wet or dry-well configuration?

Wet-well	Dry-well

5. Is the steam table electric or gas?

Electric	Gas

6. Is it custom-made or off-the-shelf?

Custom	Off-the-Shelf

7. Do you use lids for the steam table pans?

Yes	No

8. How are the burners controlled? (knob, electric set point/other)
   - Electric Set-point
9. Do you know the burner rating, or heating capacity in Btu/hr. or Watts, if electric?

Yes	No

10. If yes, please provide the rating in Btu/hr. or Watts, if electric?
    - N/A
11. What types of foods are heated in the pans?
    - Beans, spicy chicken, side dishes, etc.
12. Days of operation:
    - 7 days
13. Operating hours per week:
    - 10.5 hours
14. Steam Table Location:

Kitchen	Dining Room

Respondent #27

Restaurant Type: Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 11 (11am-10pm)

1. Do you have steam tables?

Yes	No

2. How many?
   - 1
3. Number of pans for each steam table?
   - 6
4. Is the steam table a wet or dry-well configuration?

Wet-well	Dry-well

5. Is the steam table electric or gas?

Electric	Gas

6. Is it custom-made or off-the-shelf?

Custom	Off-the-Shelf

7. Do you use lids for the steam table pans?

Yes	No

8. How are the burners controlled? (knob, electric set point/other)
   - Knobs
9. Do you know the burner rating, or heating capacity in Btu/hr. or Watts, if electric?
   - No
10. If yes, please provide the rating in Btu/hr. or Watts, if electric?
    - N/A
11. What types of foods are heated in the pans?
    - Melted cheeses, butter, other sauces for finishing.
12. Days of operation:
    - 7 days
13. Operating hours per week:
    - 11 hours
14. Steam Table Location:
    - Kitchen

Respondent #28

Restaurant Type: Casual Dining
Interviewee Role/Position: General Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 10 (Average over the week)

1. Do you have steam tables?

Yes	No

2. How many?
   - 34
3. Number of pans for each steam table?
   - 2 to 3
4. Is the steam table a wet or dry-well configuration?

Wet-well	Dry-well

5. Is the steam table electric or gas?

Electric	Gas

6. Is it custom-made or off-the-shelf?

Custom	Off-the-Shelf

7. Do you use lids for the steam table pans?

Yes	No

8. How are the burners controlled? (knob, electric set point/other)
   - Electronic Set-Points
9. Do you know the burner rating, or heating capacity in Btu/hr. or Watts, if electric?

Yes	No

10. If yes, please provide the rating in Btu/hr. or Watts, if electric?
    - N/A
11. What types of foods are heated in the pans?
    - All hot-ready foods on the menu, extensive list.
12. Days of operation:
    - 7 days
13. Operating hours per week:
    - 12 hours
14. Steam Table Location:

Kitchen	Dining Room

Respondent #29

Restaurant Type: Casual Dining
Interviewee Role/Position: Regional Manager
Type of Cuisine: American
Operating Days per Week: 7
Operating Hours per Day: 10 (Average over the week)

1. Do you have steam tables?

Yes	No

2. How many?
   - 33
3. Number of pans for each steam table?
   - Average of 2 per table
4. Is the steam table a wet or dry-well configuration?

Wet-well	Dry-well

5. Is the steam table electric or gas?

Electric	Gas

6. Is it custom-made or off-the-shelf?

Custom	Off-the-Shelf

   - Corporate sets standard for all franchised locations. RM does not think the owner had them custom built, typically the countertops are built around the tables.
7. Do you use lids for the steam table pans?

Yes	No

8. How are the burners controlled? (knob, electric set point/other)
   - Knobs
9. Do you know the burner rating, or heating capacity in Btu/hr. or Watts, if electric?

Yes	No

10. If yes, please provide the rating in Btu/hr. or Watts, if electric?
    - 1000 Watts per table
11. What types of foods are heated in the pans?
    - All hot-ready foods on the menu, extensive list.
12. Days of operation:
    - 7 days

13. Operating hours per week:
    - 12 hours
14. Steam Table Location:

Kitchen	Dining Room

Respondent #30

Restaurant Type: Fast Casual Dining
Interviewee Role/Position: Manager
Type of Cuisine: Chinese
Operating Days per Week: 7
Operating Hours per Day: 12.5 (9:30am-10pm)

1. Do you have steam tables?

Yes	No

2. How many?
   - 2
3. Number of pans for each steam table?
   - 12
4. Is the steam table a wet or dry-well configuration?

Wet-well	Dry-well

5. Is the steam table electric or gas?

Electric	Gas

6. – Recently switched from steam wells:
7. Is it custom-made or off-the-shelf?

Custom	Off-the-Shelf

   - Corporate custom builds dry-well induction steam tables for each location. They prefer dry-well for labor saving reasons, but they did not specify preferring electric over gas.
8. Do you use lids for the steam table pans?

Yes	No

9. How are the burners controlled? (knob, electric set point/other)
   - Electronic Set-Points
10. Do you know the burner rating, or heating capacity in Btu/hr. or Watts, if electric?

Yes	No

11. If yes, please provide the rating in Btu/hr. or Watts, if electric?
    - 1110 Watts per table
12. What types of foods are heated in the pans?
    - Entire menu.
13. Days of operation:
    - 7 days

14. Operating hours per week:
    - 13 hours
15. Steam Table Location:

Kitchen	Dining Room

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