Market Sector Profile:
Small and Medium-Sized Food Stores - Final

Massachusetts Program Administrators and EEAC Consultants

Prepared by DNV GL
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1. INTRODUCTION

This market sector profile is provided as part of the Massachusetts Existing Buildings Market Characterization study. It provides an overview of small and medium-Sized Food Stores using industry information and the Massachusetts Commercial and Industrial (C&I) Telephone Survey data collected between September and December 2013.

The purpose of the market sector profile is to:

1. Provide the Massachusetts Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC) Consultants with a more detailed understanding of small and medium size food stores.
2. Identify key customer data and show the distribution of building, decision making and equipment characteristics across the customer size segments and building uses.
3. Identify key potential energy efficiency opportunities or areas that warrant further investigation using primary and secondary data.

Methodology / Data Sources

The market sector profiles were developed by:

1. Analyzing the buildings, operations and maintenance practices, and equipment information collected from food stores during the Massachusetts C&I Customer Telephone Survey (MA C&I Telephone Survey) conducted on behalf of the PAs and EEAC in the fall of 2013.

2. Collecting and reviewing information on the food store industry from secondary data sources including: the California Energy Use Survey (CEUS); Commercial Buildings Energy Consumption Survey (CBECS); Energy Information Administration (EIA), and the Department of Energy.

3. Comparing the data from the Massachusetts C&I Telephone Survey with the secondary sources and reporting the results.

Thirty-four respondents to the Massachusetts C&I Telephone Survey were small or medium food stores. Of those, 28 of those were in the small food store category, and 6 were in the medium size food store category.

Small and medium sized food stores were defined in this research according to their level of electricity demand (kW). Small food stores had less than 300 kW demand while medium size food stores had an annual demand of 300 to 750 kW.

Due to the small number of respondents in each of the sub-categories (i.e. small and medium food stores) the findings may not be representative of all small and medium size food stores in Massachusetts. Survey findings are reported accordingly.

This profile contains:

- A general industry overview
- A synopsis of food store characteristics according to industry data and the telephone survey (building, customer, and equipment characteristics)
- Key findings

2. INDUSTRY OVERVIEW

According to the U.S. Department of Energy, food stores (including supermarkets) use more energy per

square foot than almost any other type of commercial building because of the need to keep food refrigerated and fresh. As much as 58% of consumption is for refrigeration[1] with lighting and heating being two other major sources of energy consumption. Overall, food stores annually consume about 51 kWh of electricity per square-foot and 41 cubic-feet of natural gas per square foot.[2]

The Food Store sector primarily consists of companies engaged in retail or wholesale food sales. The sector can be divided into the six sub-sectors defined in the Commercial Building Energy Consumption Survey (CBECS).[3] Specialty/Ethnic/Deli, Convenience, Liquor Stores, Small Grocery, Supermarkets, and Retail Bakery.

The economic outlook for food stores varies significantly by subsector. With the exception of organic or natural foods sellers, specialty food stores in the U.S. had a revenue growth of less than 1% between 2008 and 2013[4]. Convenience stores on the other hand have increased food item sales recently and realized gross margins of more than 55%.[5] This trend is expected to continue as more fresh produce is provided in convenience stores, and even in large retail stores like Walmart.[6]

The shift in customer demand and sales trend is due in part to public health organizations targeting stores that have traditionally sold chips, canned foods and sugary snacks to help promote healthier living and better choices for consumers.[7] Overall food stores are likely to become more energy intensive because stores will carrying more fresh-food products, frozen food and prepared foods.[8]

[1] U.S. Energy Information Administration, E Source Data

[2] U.S. Energy Information Administration, CBECS data

[3] The Commercial Buildings Energy Consumption Survey (CBECS) is a national sample survey administered by the U.S. Energy Information Administration that collects information on the stock of U.S. commercial buildings, including their energy-related building characteristics and energy usage data (consumption and expenditures)

[4] IBIS World Research, *Specialty Food Stores in the US: Market Research Report*, November 2013.

[5] Wong, Venessa, "In Convenience Stores: More Food, Fewer Cigarettes," *BusinessWeek*, January 17, 2013.

[6] NACS, "Walmart Doubles Down on Organic Foods," April 14, 2014

[7] Granville, Kevin, "Pushing Fresh Produce Instead of Cookies at the Corner Market", New York times, October 30, 2009

[8] U.S. EPA, Building Manual "Supermarkets and Grocery Stores" January, 2008

3. MASSACHUSETTS FOOD STORE CHARACTERISTICS

3.1 Building Characteristics

Based on the responses to the C&I Customer Telephone Survey, small food stores primarily consisted of convenience and specialty/ethnic stores, while medium size food stores were comprised of mainly supermarkets.

Nearly two-thirds of the small and medium food stores interviewed in the C&I Telephone Survey lease or rent their business premises (Figure 3-2). One-third of the 28 small food stores that were surveyed owned their building. Of the customers surveyed, None of the six medium-sized customers owned the buildings that they occupied.

Of the customers surveyed, the number of those who operated out of single, unattached buildings was 55% and those who operated from a space that was part of a mall or low-rise complex was 41%

26% of the small and medium food stores operated in buildings that were built before 1970; however, nearly 30% of these customers have been in their place of business for less than 10-years.

Figure 3-2. Building Ownership Status

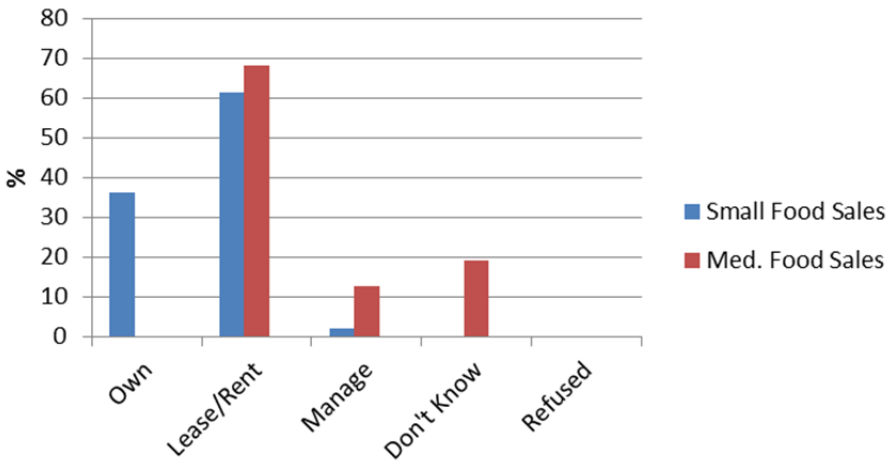
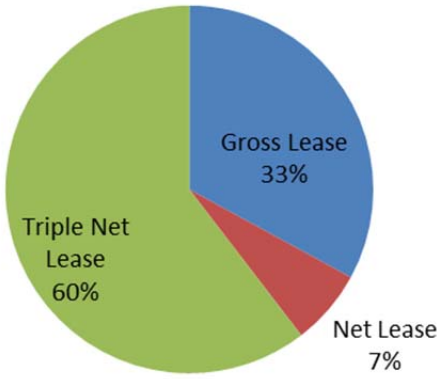


Figure 3-3. Leasing Arrangements



The leasing arrangements vary across customers. Over two-thirds respondents who reported their lease structure operated under a net or triple-net[9] lease wherein operating costs vary based on operating expenses. Thirty three percent of small and medium food stores reported being under a gross lease structure wherein the building owner assumes all operating expenses including utilities.

One of the main deterrents to energy efficient improvements can be commercial real estate leasing structures and the issue of "split incentives."

1) Under a gross lease, the tenant has no incentive to conserve or upgrade to energy efficiency equipment since the utility costs are billed to the building owner.

2). Under a net lease the building owners have to make the investment while the tenant becomes the beneficiary of the reduced operating expenses. The result is the building owners have little direct financial incentive to invest in more efficiency equipment. Additionally, in net lease unless the tenant space is separately metered or sub metered, all of the tenants pay a pro rata share of the building's energy costs. In this case, tenants share in both the reward of reduced energy consumption and the costs of other tenants' wasteful energy consumption. This results in little incentive for tenants to modify their behavior or implement any energy-reduction strategies.[10]

Finally, whether the tenant owns the property, lives under a gross or net lease in all three situations the high capital expenditure and long payback period can pose as a financial barrier to energy efficiency upgrades.

3.2 Customer Characteristics

More than half of the food store customers surveyed in the Massachusetts C&I Customer Telephone Survey were specialty, ethnic grocery or deli or convenience stores. The remaining respondents included liquor stores, small grocery, and stores that carry fresh produce or other food items.

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In a Net Lease, tenants pay all or some of the property taxes, building insurance and operating costs, including utilities as part of rent to the lessor. In a Triple-Net Lease, the tenant pays all three- taxes, insurance and operating costs in addition to rent. A Gross lease is where the landlord of the building pays the property taxes, maintenance costs and building insurance

10 Rocky Mountain Institute / Building Owners and Managers Association, "Working Together for Sustainability: The RMI – BOMA Guide for Landlords and Tenants," June 2012

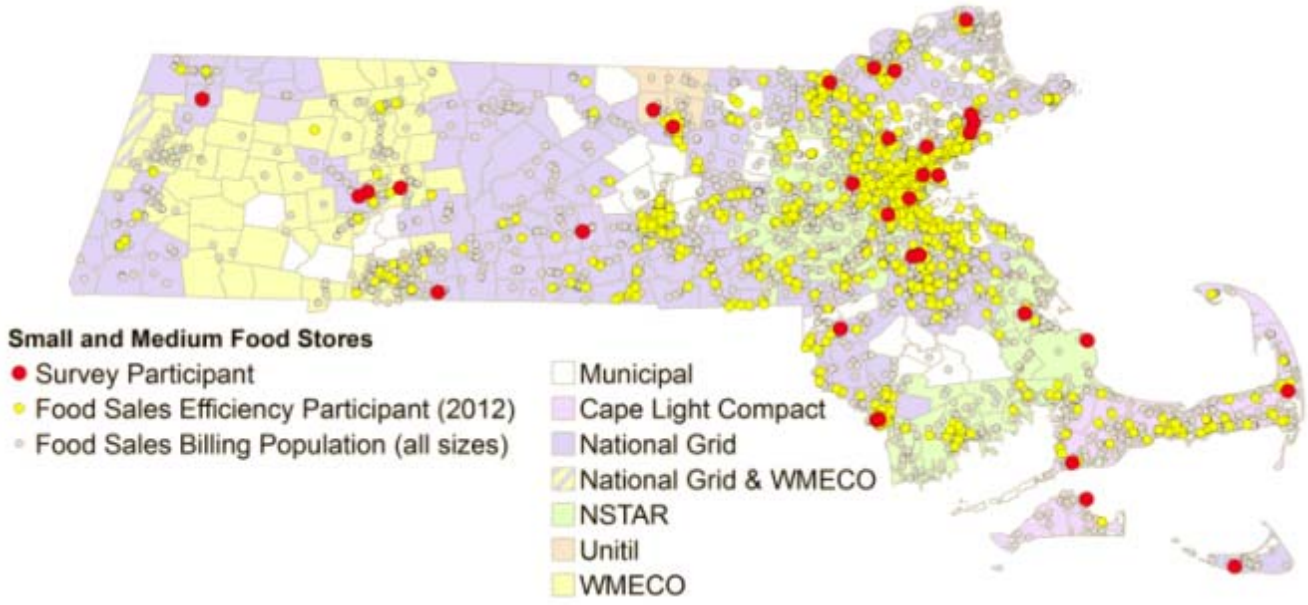
Table 3-1. Breakdown of Food Store Subsectors Surveyed

Type of Food Store	MA Survey Distribution
Specialty/Ethnic Grocery/Deli	9.6%
Convenience Store	7.2%
Liquor Store	3.3%
Small Grocery	7.8%
Supermarkets	47.7%
Retail Bakery	0%
Other[11]	24.6%

34% of the customers) who responded to the telephone survey were not part of a chain or franchise.

[11] This category includes entities for which food sale is not a primary service/business but may contain a food sales store as part of the larger facility.

Figure 3-4. Total Population and Location of Survey Participants



Overall, small and medium-sized food stores who participated in the electric energy efficiency programs in 2012 were primarily clustered around cities and surrounding communities of Boston, Lowell, Worcester, and Springfield (Figure 3-5). Many food stores in smaller cities and towns in central and western Massachusetts did not participate in 2012. Gas program participants in 2012 were located primarily in eastern and southeastern Massachusetts (Figure 3-6).

The maps also show several areas of aggregate high energy usage, where multiple food stores operate, and where none participated in 2012 efficiency programs.

Figure 3-5. Electric Program Participants According to Electric Consumption

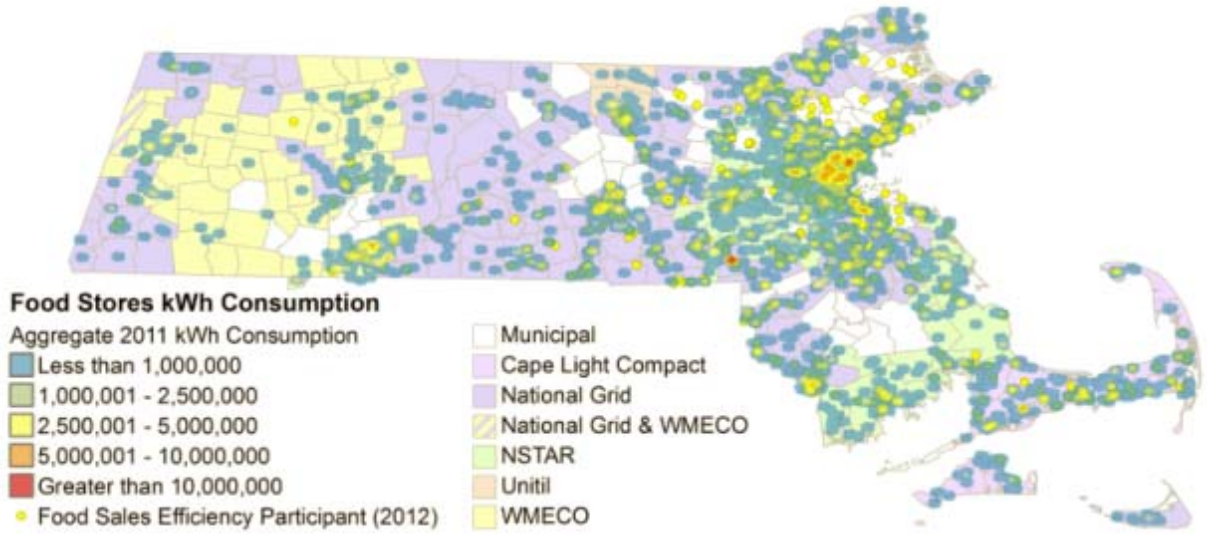
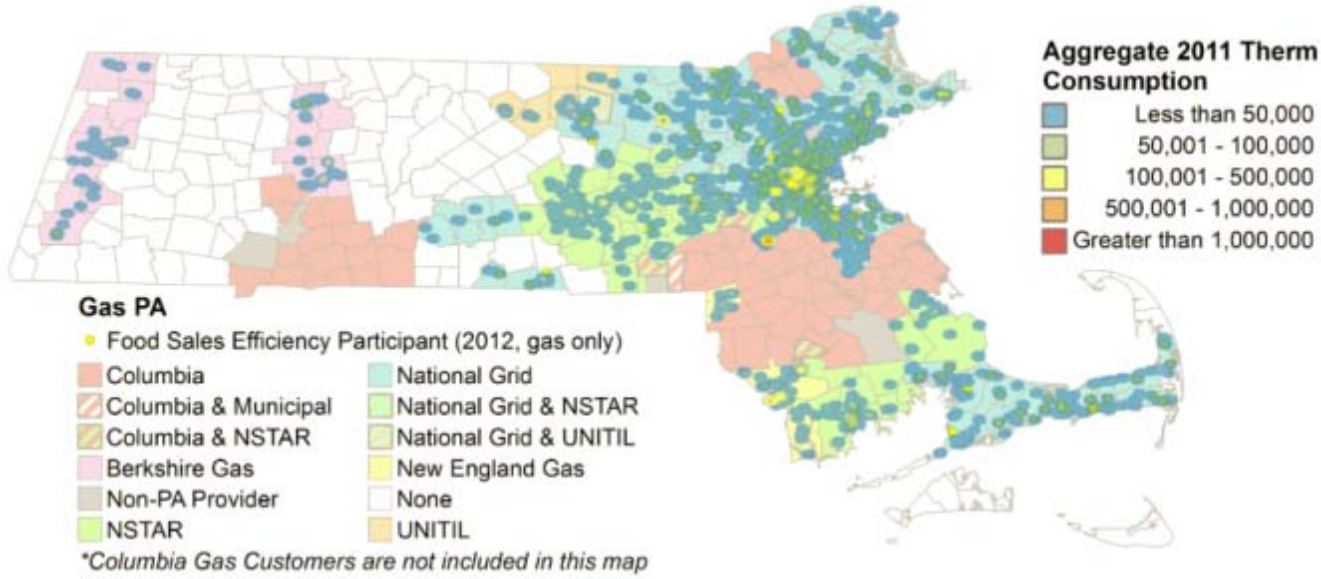


Figure 3-6. Gas Program Participants and Gas Consumption



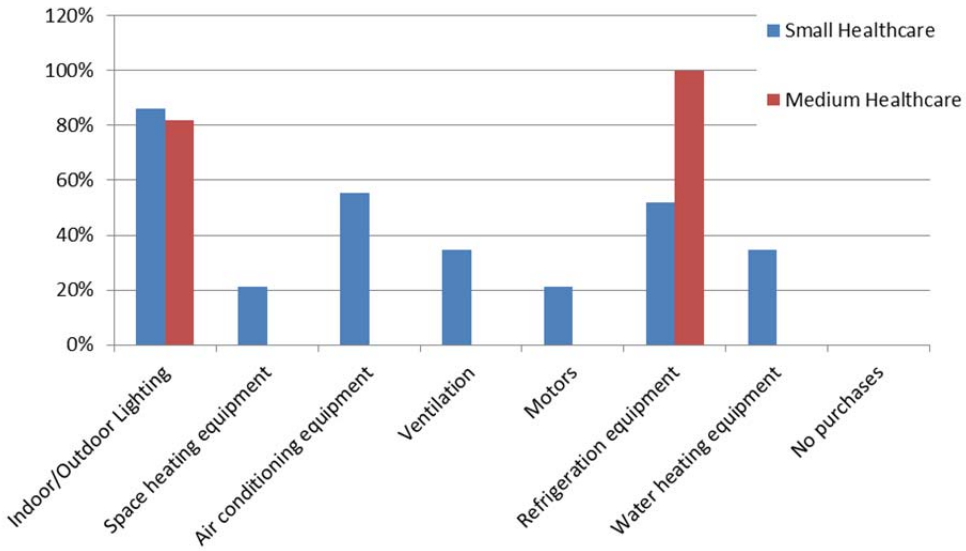
Less than 25% of small food stores surveyed reported that they had undergone major renovations[12] in the last five years. For medium size food stores, only around 7% reported having made major renovations in the last five years, while more than 35% of the respondents for medium size food stores did not know if any renovations had been made in the time period.

[12] Major renovation is defined as a renovation in which the majority of the facility has been impacted involving multiple end uses.

Among the food stores that did make improvements to their facilities, most focused on indoor lighting measures (55%). Only small food stores made air conditioning equipment changes (4%) The remainder improved their refrigeration systems, water heating equipment and space heating equipment.

When asked about projects under consideration, 85% reported that additional lighting measures were being considered. This response aligned with the fact that lighting continues is a major contributor to the food store energy costs according to both national data and Massachusetts survey[13]. Refrigeration and air conditioning, upgrades were also found to be of interest to the customers surveyed.

Figure 3-7. Future Energy Efficiency Considerations for Food Stores



Customers indicated that the reason they did not go forward with implementing additional measures related to:

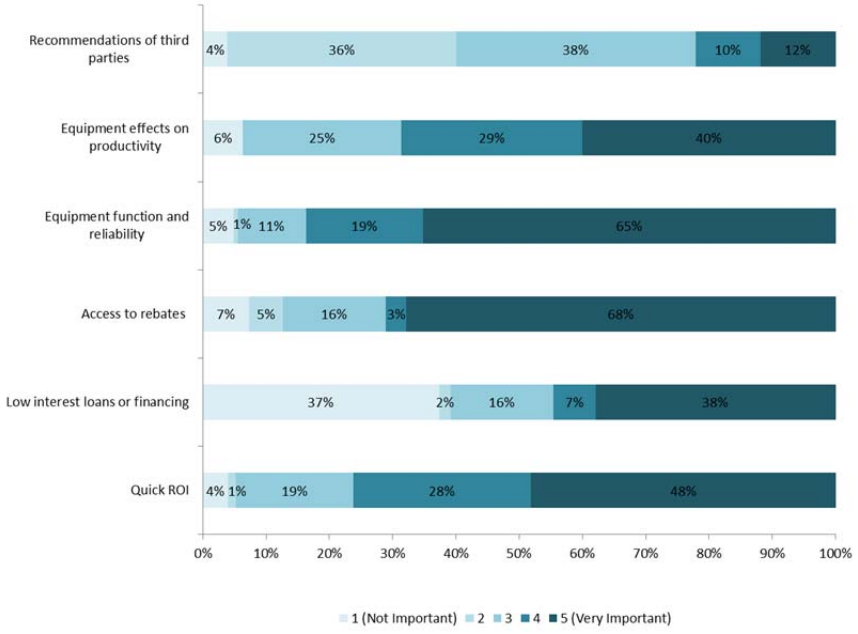
- Lack of or no funds available for investments
- Energy savings could not justify the costs
- Lack of time or personnel

3.2.1 Investment Decision Factors

Food store managers and owners considered a variety of factors when assessing whether or not to undertake equipment upgrades. However, according to the MA C&I telephone survey results, access to rebates was the most important factor driving investments in new equipment purchases for small and medium food stores. On a scale of 1 to 5, with 5 being 'very important,' 68 % of survey respondents answered that this was 'very important' when making these types of decisions. This was closely followed by equipment reliability that 65% rated 'very important.' The common mention of reliability as a feature indicated that customers' may be experiencing poor performance as equipment nears the end of its life.

[13] According to the Massachusetts C&I Telephone survey, small and medium food stores indicated lighting, refrigeration and air conditioning as the major energy end-uses.

Figure 3-8. Importance of Investment Decision Factors



National data has shown that common reasons for food stores to initiate upgrades of energy-related systems include:

- Malfunctions and shortened lifetime of equipment due to improper maintenance and operations (e.g. excessive cycling of refrigeration compressors due to incorrect refrigerant charge)
- Poor equipment function due to incorrect settings

- Changes to interior spaces that have not been accompanied by corresponding changes to heating, cooling, and lighting systems and control regimes
- Previous attempts to reduce energy use by inappropriate measures, such as covering vents or turning off anti-sweat heaters in display cases
- Inadequate ventilation systems, high levels of indoor air contaminants from products or activities (such as cooking), and poor acoustics
- Multiple rooftop air-conditioning units that are hard to control and maintain properly
- Refrigerant leaks or phasing out of ozone-depleting refrigerants
- Major capital equipment, such as a boiler or a roof that is nearing the end of its useful life[14]

Previous research has also shown that owners and managers also recognize non-energy benefits when making energy efficient upgrades including savings on external labor for maintenance and on parts and supplies[15]. Non-energy benefits that have been noted include:

- For lighting improvements – increased sales because their customers could see the food items better
- Improved network/communications – ability to collect status updates directly from equipment which in-turn can lead to more efficient maintenance contracts (the type of issues are known prior to sending a contractor in the field)… This is particularly relevant to large chain stores.
- Reduced replacement costs and costs for labor

The non-energy related savings associated with energy efficient upgrades pose a significant cost saving opportunity. Energy efficient upgrades are more reliable and have lower operating and maintenance costs that may be overlooked when assessing the return on investment and payback for these opportunities. Since reliability of equipment is critical to healthcare facilities the upgrade with lower risk of failure at a lower cost provides a significant benefit. The promise of savings from parts and labor alone can be difficult to parlay into effective selling points for energy efficient upgrades. Electricity and gas savings are concrete whereas savings derived from avoided labor, longer lasting parts, fewer maintenance calls are harder to quantify and are often driven by customer specific management decisions. Combining non-energy benefits with direct energy and cost benefits in promotional materials may further enhance energy efficiency marketing campaigns.

3.3 Equipment Characteristics

The majority of electric energy use in a food store is for refrigeration, lighting and air conditioning. Space heating is the largest use for natural gas, although natural gas is also used for cooking, and water heating. The energy use in a food store will vary according to the store's square footage and operating hours. Gas consumption within supermarkets will vary depending on the amount of prepared food facilities[16].

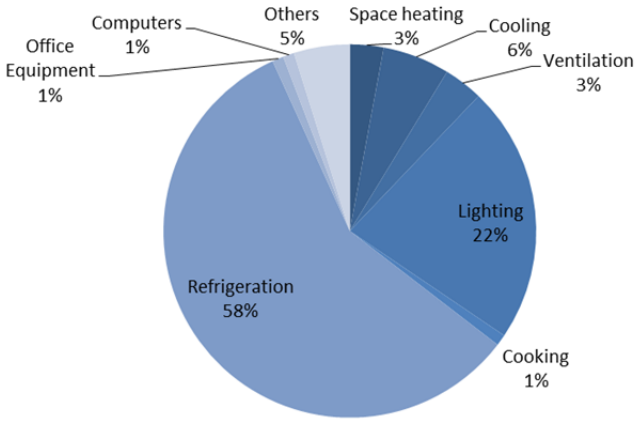
[14] U.S. EPA, Building Manual "Supermarkets and Grocery Stores" January, 2008

[15] Massachusetts Program Administrators, "Commercial and Industrial Non-Energy Impacts Study," June 2012

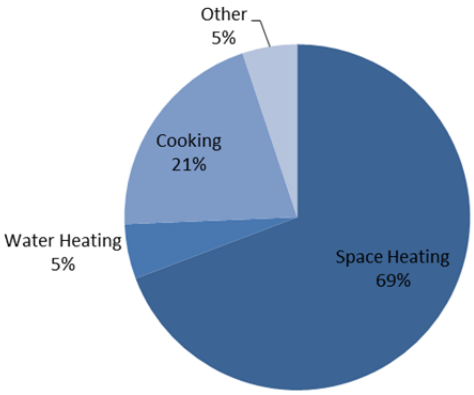
[16] U.S. EPA, Building Manual "Supermarkets and Grocery Stores" January, 2008 / CBECS 2003

Figure 3-9. Average Energy End-use Profiles Food Stores[17]

Electric



Natural Gas



3.3.1 Heating and Cooling Equipment

According to the MA C&I telephone survey results, most small food stores (24%) had split-system heat pumps as the primary heating equipment. In general, split system heat pumps are not common among small food stores and the responses may reflect unfamiliarity with the actual equipment installed in the facility. The self-reported responses will be verified and validated as part of the C&I On-site data collection work. For medium sized food stores, nearly 86% reported rooftop or packaged heating units.

[17] U.S Energy Information Administration, Commercial Buildings Energy Consumption Survey, CBECS 2003

Table 3-2. Primary Heating Equipment, Small & Medium Food Stores

Heating Equipment	Small Food Stores	Medium Food Stores
Split-system heat pumps	24.3%	0.0%
Portable space heaters, other than heat pumps	4.4%	0.0%
Rooftop or packaged heating units, other than heat pumps	21.8%	85.7%
Central boiler(s) that produce steam or hot water	3.6%	0.0%
Central furnace(s) that heat air directly, without using steam or water	15.9%	0.0%
Other / Don't Know	30%	14.3%
Total	100.0%	100.0%

For cooling systems, most small food stores (24%) reported having split-system heat pumps as the primary cooling equipment; again this finding raises questions that will be further investigated during on-site visits. For medium sized food stores, all of the customers surveyed use rooftop packaged units for cooling.

Table 3-3. Primary Cooling Equipment, Small & Medium Food Stores[18]

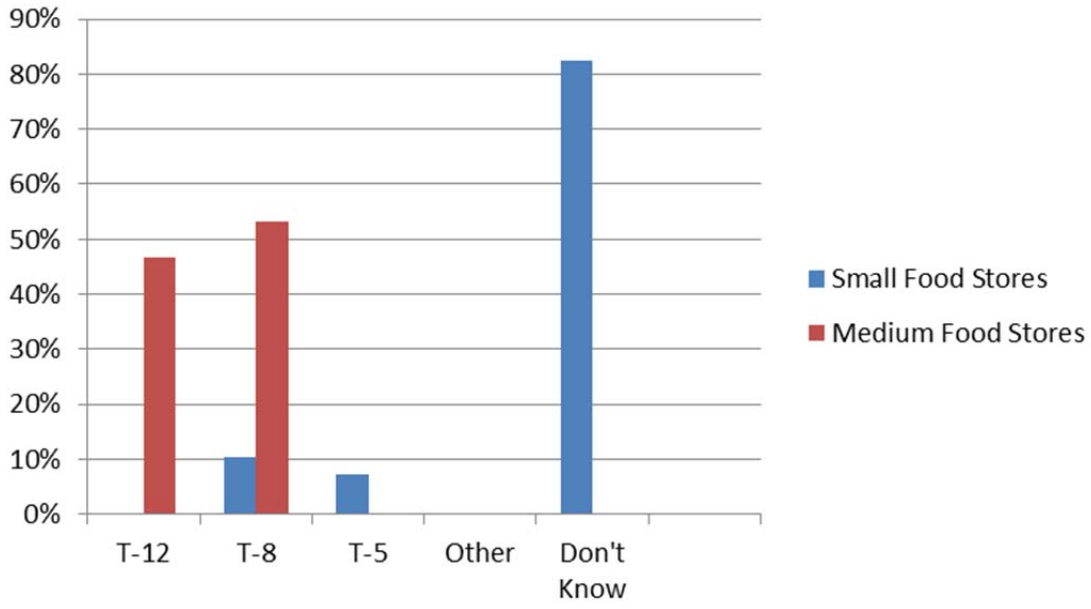
Cooling Equipment	Small Food Stores	Medium Food Stores
Central chilled water plant	6.5%	0.0%
Packaged air conditioners	3.6%	100.0%
Split-system heat pumps	24.3%	0.0%
Split-system air conditioners	9.3%	0.0%
Individual window or wall units	1.9%	0.0%
Other / Don't Know	54.4%	0.0%
Total	100.0%	100.0%

3.3.2 Lighting

Linear fluorescents were found to be the primary lighting source installed for both small and medium sized food stores. Survey results indicated that there are still a number of T-12 linear fluorescents that are in use in Massachusetts. About half of the medium size food stores who responded to the survey, indicated they have T-12s installed. For the small food stores, a significant number (82%) did not know what type of linear fluorescent lights they had in use. Again, the self-reported responses will be corroborated and validated through on-site data collection activities.

[18] Data summarized within this table has been self-reported and may not be representative of broader industry. This data will be verified during the onsite assessment.

Figure 3-10. Type of Linear Fluorescent Lights Installed



About 70% small and 54% medium-sized food stores indicated they have LEDs installed, either indoors or outdoors on their premises. The respondents indicated they have some familiarity with LED technology with nearly 60% of small stores reported being "somewhat familiar" with LEDs. All of the medium size respondents indicated they are "somewhat familiar" with the technology.

Of those food store customers who do have LED lights installed, 56% of the customers reported installing LEDs to replace linear fluorescents, 17% used LEDs to replace screw-in light bulbs, and 74% use LEDs as spot lights.

3.3.3 Refrigeration

The MA C&I telephone survey confirmed that refrigeration is a major energy end-use of food stores. 97.5% of all customers have refrigeration systems and 94.2% of the respondents surveyed reported it was one of the major contributors to total energy costs. The survey however, did not collect information specific to the type and number of refrigeration systems in Massachusetts based stores. More specific information on refrigeration systems will be collected during the upcoming MA C&I Customer On-site Assessments.

3.3.4 Energy Management Systems, Controls and Sensors

According to the MA C&I telephone surveys, 35% of customers (weighted by kWh) reported not having EMS. All of these respondents were small food stores. All of the medium sized food stores indicated they did have utilize a building EMS. Of those who did use EMS, the systems were primarily used to control heating and cooling systems, auxiliary heating and cooling systems, ventilation, and lighting.

All of the medium size food stores indicated they did have occupancy sensors in use while only 27% of the small food stores indicated that they use occupancy sensors. Occupancy sensors were generally used in individual office spaces, meeting rooms, warehouse or storage areas, kitchens and lavatories according to survey results.

4. KEY FINDINGS

The main electricity uses in the small and medium food stores were lighting, refrigeration, and air conditioning. Among the MA C&I customer telephone survey respondents, the most common measure completed since 2011 was lighting upgrades. This was also the most common measure under consideration, although around 70 % of the customers) also reported the refrigeration and 35% reported that air conditioning measures were being considered. With only 25% of small food stores reporting that they had undertaken renovations in the last 5-years, there may be good opportunity with in the industry for increased energy improvements in the years to come.

PAs may consider the following to increase savings from energy efficiency programs in the small and medium-sized food store sector:

Retro-Commissioning for HVAC and Refrigeration systems. Besides lighting, air conditioning and refrigeration are the largest consumers of energy. Additional savings may be achieved through the assessments and optimization of HVAC and refrigeration systems[19]. In the U.S., a main driver for replacements is malfunctions and shortened lifetime of equipment due to improper maintenance and operations such as excessive cycling of refrigeration compressors due to incorrect refrigerant charge. The PAs should investigate cost effective opportunities for offering retro-commissioning services to customers. This type of service is typically most cost effective in facilities with large savings opportunities.

Continue to capture opportunities for LED in refrigerated cases. About half of small and medium Food Stores have no LEDs installed inside or outside their premises. According to previous research[20] food stores that installed LED lighting in refrigerated and frozen food cases reported an increase in sales because their customers could see the food items better. This finding is particularly valuable for smaller stores where impulse buys play a role in purchasing[21].

Enhance marketing strategies. Small and medium-sized Food Store customers reported lack of familiarity with LEDs and misperceptions about LED technology benefits, which suggest enhanced marketing and outreach, would be helpful. Launch multi-pronged marketing strategy to increase awareness of energy efficiency measures and benefits of program participation.

Develop marketing materials based on case studies. The PAs are aware that developing case studies for customers, their efficiency projects, and subsequent experiences with direct and indirect savings are powerful marketing tools. Small and medium Food Stores are no exception. While the quantification of avoided maintenance, less expensive parts and replacement costs, and avoided produce spoilage and labor losses due to equipment failure are difficult to determine, supplementing energy efficiency promotional items with non-energy benefits may provide effective peer-to-peer stories that can provide additional benefits of the value of investing in new, efficient equipment.

[19] Due to the engineering costs, Retro-commissioning for small facilities may not be cost effective

[20] Massachusetts Program Administrators, "Commercial and Industrial Non-Energy Impacts Study," June 2012

[21] ibid

Take advantage of business expansion plans. Research shows that convenience stores are beginning to offer more pre-prepared food items which may represent a potential key sub-market. The expansion of food offerings may present opportunities to promote the purchasing of more energy efficient refrigerated cases, lighting, cooking and warming appliances. This also applies to stores that plan to expand their stock of frozen or refrigerated food items.

About DNV GL

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