

# **Building a Better Mousetrap Better Program Designs for the Retail Food Submarket**

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## **Abstract**

Energy use is often less than five percent of the cost of operations for retail grocers, but reducing energy and therefore energy costs goes straight to the bottom line and represents sure profit. It is a controllable expense. If energy is three percent of overall costs, then a million dollar reduction in energy costs translates to a reduced need to sell \$33 million dollars of product. This paper describes key players in the retail grocery submarket, the investment strategies of key players, what key players are and are not doing about energy efficiency and strategies for marketing energy efficiency to large retail players

The paper is based on findings from a comprehensive study designed to understand critical market drivers in the commercial buildings sector. This paper focuses on the critical changes that are facing operators in the retail grocery submarket, one of the most energy intensive commercial building sectors.

## **Introduction**

This research is a comprehensive analysis of the retail food sales submarket based on an exhaustive literature review of materials on the worldwide web and a series of in-depth interviews with 12 respondents from the 54 largest players in the submarket. The research is part of a larger study sponsored by the Department of Energy's National Research Energy Laboratory (Reed, forthcoming). This is a submarket that is changing rapidly where a few large players dominate and have the potential to influence practices throughout the submarket.

Part of the reason for the focus on retail food sales is that there are 54 large retail food sales firms, that operate half of the retail foods sales building, and that account for \$400 billion or three quarters of the retail food sales market (Reed, 2004). Another reason for focusing on this submarket is that the buildings in this submarket are among the most energy intensive ( average 200 KBtus per square foot) of all buildings in the commercial sector (about 100 KBtus per square foot) (CBECs, 1999).

The retail food sales submarket used to be fairly well delineated within the larger commercial market. However, the lines are blurring as retail stores (i.e., Wal-Mart, Costco and others)

venture into the grocery market, convenience stores expand their space offerings to compete with these stores, and grocers buy or start-up convenience stores

Grocers in the United States are facing a particularly challenging time. Rising costs for new construction and equipment, greater differentiation of target markets, and location of new stores in more highly urbanized areas mean that grocers are beginning to construct smaller rather than larger stores. They are also facing the challenge of rising energy costs, stricter building codes, and higher operating costs that means that this traditionally low-margin industry will have to be even more creative to survive. However, these approaches may not be the most effective response against the growing competitive threats from wholesale warehouses and the largest grocer in the United States — Wal-Mart.

This paper explores the following:

1. The blurring of product lines has led to the development *of new store formats* that
2. Will fundamentally change the *types of energy technologies used and the ways in which energy is used*
3. *Which means that energy efficiency opportunities and strategies* as well as programs to target these submarkets will have to change as well.

## **Changing Store Formats**

As the distinction among store formats has blurred, some grocers are trying to develop new and unique concepts that will entice customers. For example, Food Lion is experimenting with two concepts. One is “bottom dollar” (coupons.about.com, 2005) where stores will be 25,000 – 30,000 square feet with fresh meats and produce, national brands, and private labels at discount prices. Products are offered in bin boxes, cut boxed cases, and pallets for quick shopping. Customers bag their own groceries. The atmosphere is bright and cheery.

The second store concept that Food Lion has developed is a high-end alternative called “bloom.” This store promotes a hassle free shopping message and focuses on its prepared food lines called Table Top (Field, 2005). With the bloom concept, Food Lion has rethought food merchandising, by arranging products by customer need or group rather than by brand. It also offers in-store customer interface technology to make the shopping experience more pleasant. Finally it offers high quality, greater selection of produce and seafood, and wine (Lowerance, 2005; Progressive, 2005).

Giant Food, based in Maryland, has developed a more town-centered approach. The grocery store is designed to blend in with the neighborhood format of a local bank, restaurants, and other retailers (Field, 2005).

Several national firms have also begun emphasizing various differentiation strategies. For example, Kroger is developing multiple pricing strategies and assortment mixes that cut across many markets by offering a diverse mixture of ethnic foods and prepared foods across its various store brands (Progressive, 2005a).

Regional chains are experimenting with new niche formats to serve more diverse customer bases. For example, Publix has created a new brand, Publix Sabor, that caters to Hispanics in central and south Florida. The two debut stores, which are remodels of existing Publix locations, feature expanded offerings of Hispanic fresh food and grocery categories and are staffed with bilingual personnel (Progressive, 2005a).

Associated Grocers was founded in 1934 to help independent grocers compete against the big-chains. By pooling resources, independent stores can compete better with the buying power of larger firms. Because of their diversity it is sometimes difficult for these owners to cooperate. As one independent grocer explained, "Independent grocers have so many independent ideas; it has been hard for us to learn how to work together (Mulkady, 2002)"

Independent grocers in the Northwest understand their customers really well and are willing to adjust their stores to meet the needs of their neighborhoods," said Mary Burke, chairwoman of the board of directors for Associated Grocers in Seattle. "That might mean a large wine selection in one store, or a tortilla-making machine in another store, or a big organic selection (Mulkady, 2002).

One independent grocer explained his store's marketing strategy this way:

We tell our customers to go to the big box store every two weeks, but come to see us in between for their fresh produce, flowers, wine and meats," Michael Cawdrey, owner of Fremont Fresh Market. "We definitely make an effort to stock local products like salsa, wine, beer and candy (Mulkady, 2002)."

Equipment vendors with whom we spoke said that the independent grocer market is hard to reach because of the lack of organization and lower levels of capitalization.

UBS Securities warns that in the future, the supermarket model "could die a slow death" at the hands of Wal-Mart and other nontraditional formats, unless supermarket operators make major changes. Supermarkets may become more efficient by scaling back the total number of SKUs and instead focus on the strongest leading brands and private label, and sell this smaller assortment at lower prices to net greater sales per square foot. Volume, not margin, will be critical. USB advocates that supermarket chains throw away the "crutch" of vendor dollars that has led them to squeeze too many SKUs onto the shelves in the first place. This future model requires supermarkets to make their money on the sell, rather than being obsessed with making money on the buy (Progressive 2002b).

These trends suggest several important things. First, there is a lot of ferment and change in the retail food sales submarket, which means that buildings are being built and renovated presenting new opportunities. Second, much of this change is centrally driven, which means that one can focus on a relatively small number of decision-makers. Third, because of the holdings of these few large firms, it may be possible to influence a very large percentage of energy use in this sector. And, energy is a controllable expense.

## **Retailing Strategies in the Retail Food Submarket**

Our interviews with industry executives identified two basic strategies, operational execution and merchandising, that guide the operation of firms in this submarket. Firms following an operational execution strategy give priority to limited selection, volume, cost minimization, and low price, assigning a lesser priority to merchandising. Firms that use a merchandising strategy tend to focus on broad selection, physical layout, product display, aesthetics, and customer experience. As one respondent in a merchandising organization put it, “What gets built is driven by marketing and what attracts customers.” In contrast, a colleague at an organization with an operational focus said, “Our management came from operations and we are operationally driven. Cost minimization is the key.”

The difference in the strategies is one of the relative emphasis. Marketing and cost-minimization play a role in both types of organizations. Firms recognize that customers vary in what is important to them. For some, the shopping experience is paramount while other individuals prize price, quantity, and convenience. Firms with an operational orientation do not totally eschew merchandising and firms that are oriented to merchandising do pay attention to operations.

Customers are not necessarily consistent in their preferences across product categories. For example, a customer may purchase cleaning products and canned goods from a retailer oriented to operational execution preferring the price advantage but purchase meat and vegetables from an outlet emphasizing merchandising where product display is carefully staged and there are visual cues about the merchandise. Retailers are acutely aware of this and therefore target specific niches.

## **Decision-making**

For the retail food market our respondents typically described decision-making as a team effort. The composition, the titles, and the location of team members within the corporate structure differ from chain to chain but typically participants in decision-making are responsible for one or more of the following functions:

- Finance
- Real estate
- Store location/store planning
- Architecture/design/engineering
- Construction
- Energy
- Maintenance and operations
- Marketing/merchandising

The real estate and store location functions frequently co-exist in the same part of the organization. Likewise, architecture, construction, energy and maintenance may be a part of the same organizational entity. Finance typically obtains and manages the capital and does the investment analysis using sophisticated tools and projections to evaluate new and existing investment opportunities. Real estate is responsible for acquisition of property or for the acquisition of ground and property leases. The architectural/engineering function is responsible

for the design and redesign of stores. In addition, to managing the design of stores, their duties typically include maintaining the specifications and plans for stores or prototypes for the stores. The energy manager function generally consists of purchasing energy supply, monitoring energy purchases and use, and managing energy consumption. Firms vary in how they handle maintenance and operations. Some of the respondents that we interviewed outsource maintenance while others do at least some maintenance (for example, refrigeration) in-house. Marketing and merchandising promote the store and are responsible for the customer shopping experience.

The energy efficiency decision-making and likely all decision-making in food market retail chains are the poster children for the diffusion of innovation model (Rogers, 2003). Their energy managers are constantly looking for new technologies; they investigate new technologies; they do back of the envelope calculations; they install a pilot installation; they monitor; and if the technology performs as expected, they include it in their design prototype and begin installing or retrofitting it in their stores.

For the most part these chains have design prototypes that serve as a standard for store development. Some actively maintain the prototype. Some update them on a periodic basis. And, some say that the prototype is the last store they built.

### **Decision-criteria**

Of course, a key driver in decision-making is payback or return on investment. Many of our respondents were looking for two-year returns on investment but some would entertain three or four year paybacks. One respondent said that his firm was looking for an ROI of 25 percent. One said that that his firm buys good equipment and might consider investments of up to fifteen years.

But, these are only some of the criteria. Some other criteria include:

- Customer access
- Aesthetics
- Positive customer experience or customer experience
- Reliability
- Operational cost
- Maintenance cost
- Health and safety compliance

Health and safety issues are important because of liability issues and will make or break a decision. Reliability and maintenance are important because maintenance is a major cost item in retail food sale firms. Several of our respondents said that they adopted energy efficiency technologies for the maintenance cost impacts rather than the energy savings. The energy savings were just the gravy.

### **Marketing Strategies and Their Influence on Energy**

The responsibilities for marketing and merchandising include a range of activities —picking the merchandise to be offered, arranging the location of goods within the store and traffic patterns,

deciding the format for how merchandise will be offered, choosing the aesthetics of display including the colors and the lighting (color temperature), deciding on in-store promotions and displays, and other activities. For chains with a merchandising strategy, this group plays a very important role in overall decision-making. For example, this group may determine if a chain will use open or closed cold cases

A striking example of how these decisions play out is seen in the approach to the meat preparation rooms in two different chains. Merchandisers want people to see meat being prepared and want them to have access to meat cutters. One of our respondents reported that they wanted to install windows between the preparation area and the open display cases for meat to reduce energy consumption. Meat preparation rooms are kept at 47°F while the surrounding sales areas are generally kept around 74°F. The merchandising staff vetoed this because they felt that the windows separated the meat cutters from the public. The other firm addressed this problem by installing movable windows and a buzzer just above the display case. Customers press the button to summon the meat cutter and the cutters can open the window and lean through to speak with customers.

For firms with a merchandising strategy, the views of the merchandising staff can trump the arguments of other decision-makers. What our respondents told us in the interviews is that the views of merchandising staff are based on some general principles, for example, remove impediments between the customer and the product. Merchandising personnel may be open to evaluating whether open or closed cases may represent a barrier for customers but in general they do not do experiments like their energy counterparts do. Their decisions are more frequently driven by intuition, experience, and views gained from others. Merchandising typically has clout with management because, as one respondent put it, “What they do goes directly to the bottom line.”

Thus, there is no set pattern of decision-making but there are some commonalities. At least in the retail food sector a pilot is a must. Payback or return on investment is a must. Good reliability and maintainability are musts. Compliance with health and safety requirements is a must. And, in merchandising organizations, customer acceptance is a key. In these organizations, customer acceptance trumps all.

## **Adopting Innovative Technologies**

We discussed innovation at some length with our respondents. All respondents reported substantial efforts to adopt new technologies and become more efficient. There were however some distinct differences in the approaches to technology. The larger firms with more stores (several hundred) and brands appeared to rely somewhat more heavily on vendors to bring them new technologies. Representatives of three of our 12 retail food marketing firms that were smaller, between 100 and 200 stores, two of which were privately owned, indicated that they were actively engaged in engineering design and working directly with manufacturers to develop new applications. These three respondents described new engineered applications in lighting, refrigeration, and air-conditioning. In at least two of these cases, there are patents pending.

This leads us to two tentative observations. The first is that at this stage of our research, it appears that the retail food submarket is *more aggressive* than other submarkets in pursuing

energy efficiency. Some of our respondents noted that the margins in the retail food sector are thin, two to three percent, and that energy costs are substantial and controllable. They also observed that the cost of energy is likely to increase in the foreseeable future. This drives their interest in energy efficiency.

The second observation is that the innovation in the smaller firms is driven by survival instincts, the need to be efficient to stay in the market, but it is also *culturally driven*, that is, wanting to be on the forefront of the retail food sales market and be recognized for it.

## **Energy Efficiency Trends**

All of the retail food stores reported experimenting with new technologies. The following is a summary of the technologies that are being pursued.

### **Lighting**

All the respondents have already implemented energy efficient lighting projects. However the operationally-focused ones had gone even further. One respondent reported that 98 percent of their stores have linear fluorescents and that 78 percent have been moved from T-12s to T-8s. Another firm is experimenting with high efficiency reflectors and high efficiency fluorescent lamps. It was unclear to what extent some of these firms have moved from T-8s to super efficient T-8s. Several other firms reported experimenting with newer lighting technologies including T-5 technology.

One especially innovative retailer is working closely with a local manufacturer to create an entirely new type of induction lighting system to complement the skylighting that is being installed in its stores. This firm believes that this type of lighting will improve overall energy efficiency.

One firm reported that they have now retrofitted their outdoor signs using red LEDs. Other firms are watching the progress of LED technology but have not yet begun to use it. At least three different respondents said that they are considering LEDs for case lighting. Two of the three respondents doubted that retrofitting with LED case lighting is justified on the basis of energy cost savings. As one respondent put it, "its hard to compete with fluorescents." It was also noted that LEDs are a point source technology that may not be well suited for use in cases. However, these respondents said they would likely proceed once prices come down because LEDs can be justified on the basis of reduced maintenance costs due to their long-life.

Another issue raised with respect to LEDs is that of color temperature. One of the respondents noted that LEDs are not certified for color temperature and that within a package of lamps, it is possible to have a "rainbow" of colors. Color temperature is particularly important for colors on packaging.

### **Refrigeration**

Refrigeration is the largest energy use in this submarket with refrigeration accounting for 40 and 60 percent of total energy consumption. This is a critical area of concern to all of these retailers.

Respondents from two of the more innovative firms have developed patent pending designs for new refrigerator cases. Several others are designing cases that are custom built to their specifications. Some have installed or purchased commercially available cases that are among the most efficient in the market. These cases provide non-energy benefits as well as energy benefits, for example, reducing food spoilage resulting from defrost cycles.

Several of these retailers are monitoring the development of or installing zero zone or secondary refrigeration. This technology places compressors and other components on racks outside the store. The primary refrigerant loop is kept short and a secondary loop using glycol, ammonia, or some other substance is used for distribution within the store. Refrigerant leaks are a major issue. Refrigerant is costly and it is a contributor to ozone depletion. In addition to reducing energy use, zero zone refrigeration reduces the amount of refrigerant that is used and that may leak to the environment. It is these secondary benefits, in addition to the energy benefits, that make this technology attractive to retail food sales firms.

These firms are also using or exploring the use floating head pressure systems. One firm in particular is pushing this technology to its limits. This firm has redesigned its systems so that it can be used at lower outdoor ambient temperatures than is usually the case. This provides significant energy benefits, but it requires significant monitoring and a trained and sophisticated maintenance staff as well.

Two of our respondents discussed heat reclaim from refrigeration systems. One respondent said that their stores are able to meet their heating and washware loads from heat rejected from the refrigeration system. To do this they use a reclaim condenser coil in parallel with normal condenser coil shifting operation from one to the other as need reclaiming nearly 100 percent of the heat. A Canadian case study for a retail food sales establishment reported an 11 percent reduction in refrigerator energy use and an 87 percent reduction in space heating costs using this reclaim method. The value of this may change with the region (Natural Resources, 2005).

### **Air conditioning**

One firm has developed a super efficient air conditioner, which is essentially an air conditioner with a condensing unit that looks like an evaporative cooler without water. Another is exploring dual path air-conditioning. Supermarkets must have outside air to maintain air quality and a healthy environment. At certain times of the day and in certain climates outdoor air can be quite humid. Cold cases are very effective at dehumidifying the outdoor air but this causes an increase in load due to increased defrost cycles and potential food safety issues. The dual path system recycles the inside air and separately dehumidifies the outdoor air reducing the defrost load.

### **On-site generation**

We were somewhat surprised about the amount of interest expressed by respondents for on-site generation. Several of the firms with which we spoke are experimenting with or about to experiment with various forms of on-site generation. One individual noted that interest in on-site generation as increased a great deal in the last two years both within his company and in others.



One respondent suggested that a partial reason for increased interest was a greater openness on the part of utilities to on-site generation. He observed that in his experience, utilities have been adamantly opposed to on-site generation for years.

The interest is coming not just from engineers but from CEOs and top management as well. A key driver is the recognition by firms that electricity prices have already reached \$0.13 per kWh or higher in some areas and are likely to continue rising. These increases go directly to the bottom line. These firms are interested in technologies that will disconnect them from the trends in increased energy prices.

Perhaps one of the more unique attempts at self-generation is a firm that has just opened a new store equipped with on-site generation using bio-diesel. Another firm said that it has installed and is using microturbines in some of its stores. Two of the firms we interviewed indicated that they are already using power generated from wind turbines at distribution centers and elsewhere. A third firm is thinking about wind turbines.

Nearly all of the firms are interested in the potential for photovoltaics. One of the firms with whom we spoke has installed its first PV system and has four more in the wings. These make economic sense because of the incentives. Another person with whom we spoke had a contract on his desk that he said he expected to sign for a turnkey pilot system for a store. The contract was a ten-year contract at \$0.13 per kWh. The pricing reflects the availability of incentives in the state where the store is located. This system is anticipated to supply 40 percent of base load of the store. This person expects to see energy prices substantially exceed this amount in his market area over the 10-year period.

Another firm said that it had plans for several systems ready to go. The state in which these systems would be sited has oversubscribed its solar programs and has run out of incentive money. Our informant said that the firm was very frustrated.

Representatives of two of the firms with which we spoke said that they were thinking about the potential of fuel cells. Neither appears ready to do anything about them right away although one did comment that incentives would be needed to make them competitive.

### **Energy Monitoring, Control, Performance Optimization and Integration**

The use of centralized monitoring systems is relatively recent and many firms are just beginning to implement monitoring systems. In some instances, firms have selectively installed monitoring avoiding locations where the long-term prospects of stores may be limited.

Monitoring is done at several levels. At the lowest level firms are collecting and analyzing information from billing data. Two of the respondents we interviewed indicated that their firms are using services such as Advantage IQ (formerly Avista Advantage) to process their utility (gas, water, electric) bills.

Users of the service can use data to monitor usage at specific sites. These databases are reviewed for outliers and anomalies and are used to compare building performance.

Nearly all the retail food chains that we interviewed are directly monitoring energy use and other parameters in their in at least some of their stores. Some of the retailers were just monitoring energy consumption while others are monitoring temperature, pressures (in refrigeration systems) and other variables. These systems are used to control internal and external store environments as well. One retailer said that they have 75 percent of their stores on the intranet and that they are using pulse controls to manage lighting and HVAC. Another said that they were following consumption in about half of their stores.

Of course, the increased use of sophisticated systems much be matched with the sophistication of personnel to monitor the system and to manage and maintain systems. This has to be factored into the cost benefit estimates for the system. One major national retailer with large numbers of stores and fairly sophisticated system found that they could not keep up with the alarms and the resulting information. An implication of the remark was that at present there are diminishing returns as the number of nodes in the system increase. A further implication is that systems need to be more sophisticated with respect to the importance and priority of alarms and that systems need to be smart enough so that they can dispatch commands that will cause the mechanical systems to be self-healing.

## **Integration**

One last theme that emerged from the interviews is the interest in systems integration. This theme arose in almost all of the interviews. It is illustrated by efforts to use waste heat, the integration of induction lighting with skylighting, the use of dual path air conditioning, and combinations of other technologies.

## **Implications for the Energy Efficiency Community**

There is much more that we have learned that we do not have space to present in this short paper. There are however, a number of implications of what we have learned that are of importance to the energy efficiency community. Some of the key findings are:

- There are a small number of players who control about 80 percent of the retail food sales market and roughly half of the buildings. The buildings in this market are among the most energy intensive buildings in the commercial market.
- There is substantial ferment and change in this submarket that will result in reconfiguration of buildings and present opportunities to upgrade the energy efficiency of buildings.
- Independent food retailers are likely to be difficult to reach because of the lack of central points of contact and organization.
- Vendors indicate that independent food retailers are less interested in energy efficiency
- Because of costs and a variety of other issues, the retail food sales submarket is perhaps the most aggressive in pursuing energy efficiency and renewable energy.
- There are two main business strategies in the retail food sales submarket, merchandising and operational effectiveness.
- Decision-making within the large firms is shared.
- For the most part decision-making is highly rational and driven by financial analysis.

- Nearly every firm does pilot projects as part of the decision making process.
- Payback or return on investment is the primary criteria that can make or break an investment decision.
- There are other criteria that can trump payback. These include health and safety and merchandising.
- Merchandising decisions involve a greater amount of art than experimentation.
- There is widespread attention to energy efficiency in retail food sales submarket. Many firms are moving forward with more efficient refrigeration technologies, lighting, HVAC, daylighting, monitoring and controls, and on-site generation.
- Many of the decisions to use efficient technologies are driven by non-energy considerations such as reliability and maintenance.
- There is widespread interest in renewable technologies, especially photovoltaics. This is being driven from the corporate level. Partially, this is for image reasons but it is also because these firms see an opportunity to disconnect the firm from what they perceive to be inevitably rising energy costs.

In the end, our findings suggest several important things:

- The 54 firms large firms should be a priority target.
- The effort to engage these firms has to be a national or regional effort at a minimum.
- Some of the smaller of these large firms are very interested in being leaders in the field and are willing to commit resources to develop innovative new technologies. They would be good firms to work with to develop new efficient technologies.
- Because of their size, the largest firms are more interested in efficient turnkey technologies. Efforts should be made to commercialize turnkey technologies with these firms.

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