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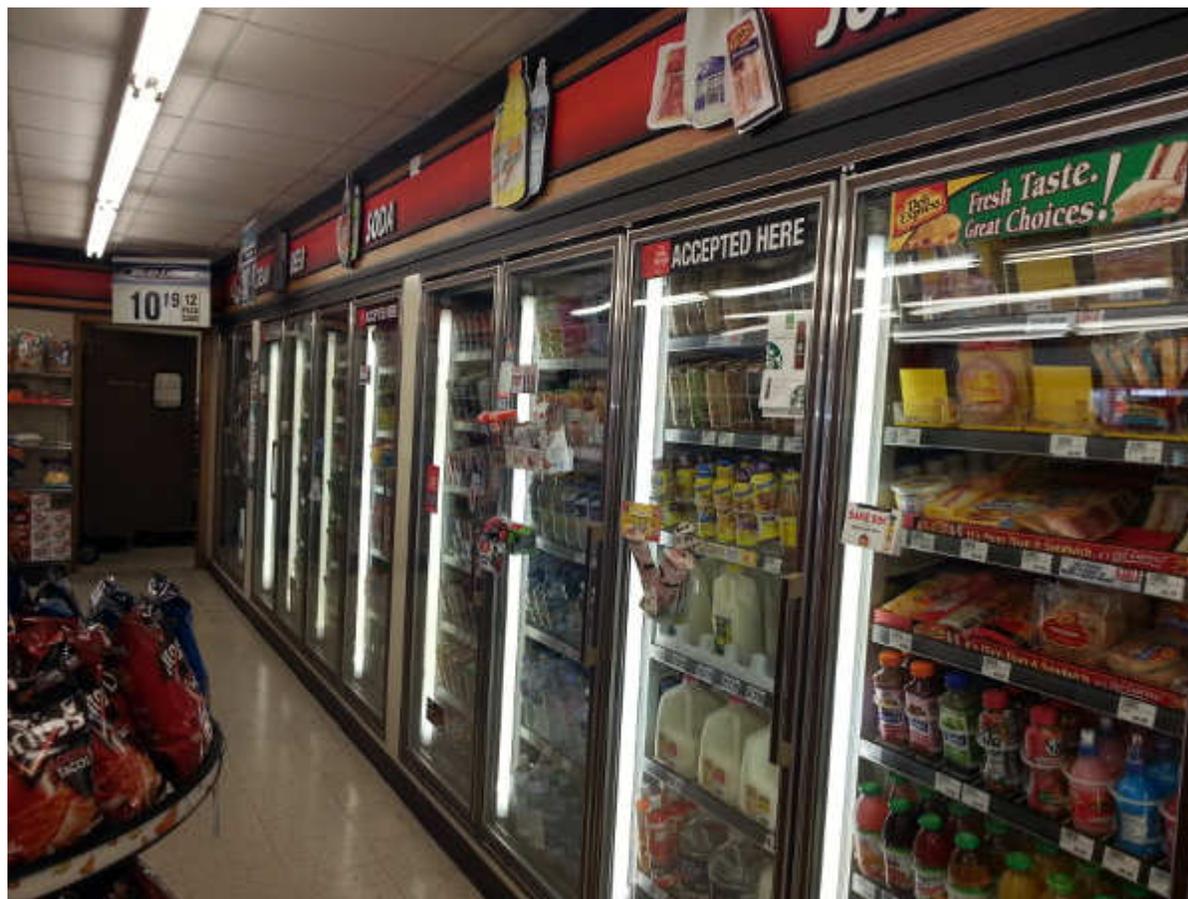
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Improving Energy Efficiency in Convenience Stores

Convenience stores that sell groceries, snacks, and gasoline are energy intensive buildings. As their business model has shifted from automotive services to retail sales of gas, food and drink, their plug load, lighting, and refrigeration loads have increased rapidly. The objective of this CARD grant, awarded to [Michaels Energy](#) of La Crosse, Wis., was to identify the energy efficiency opportunities for this market sector through energy audits in a sample of Minnesota stores, and to recommend a program design for Minnesota utilities to more effectively capitalize on those opportunities. Since heating fuel use for the stores in this sample was so minor, electricity use was a primary focus of research in this study.

To conduct this project Michaels Energy partnered with multiple utilities statewide, especially municipal utilities and coops, to assist them with accomplishing their energy saving targets, enhance their limited budgets and resources, and address a customer type that is difficult for them to impact. Stores participating in this study were split about half and half between corporate/chain ownership (29 stores) and independent/local ownership (21 stores). Small differences were noted between chain and independently owned stores in their energy use and opportunities to save energy. The study did not include small grocery stores that do not have a gas station on site, because the exterior lighting associated with the gas canopy is a significant load in convenience stores.



Lighting and refrigeration account for about two-thirds of the energy use in convenience stores.

The majority of convenience store energy is consumed by lighting and refrigeration. Those two systems account for about two-thirds of the energy use. Average annual electric use was 364,000 kWh or 94 kWh/ft². Major differences in annual energy use within the sample population might be attributed to hours of operation (with higher lighting loads for 24-hour stores), the number of plug loads in the store, and whether there was a car wash on site. Generally chain stores with car washes had the highest energy use while independent stores had the lowest energy use.

Savings opportunities

Each audit report identified cost-effective equipment upgrades in addition to operation and maintenance savings opportunities. An average total energy savings of 19 percent was identified for the participating stores (see Figure 1). That potential savings equates to about \$5,000 in reduced energy expenses per year for each store. That savings amount was consistent among the majority of the stores reviewed, in part because the higher energy user typically had fewer opportunities than the lower energy users.

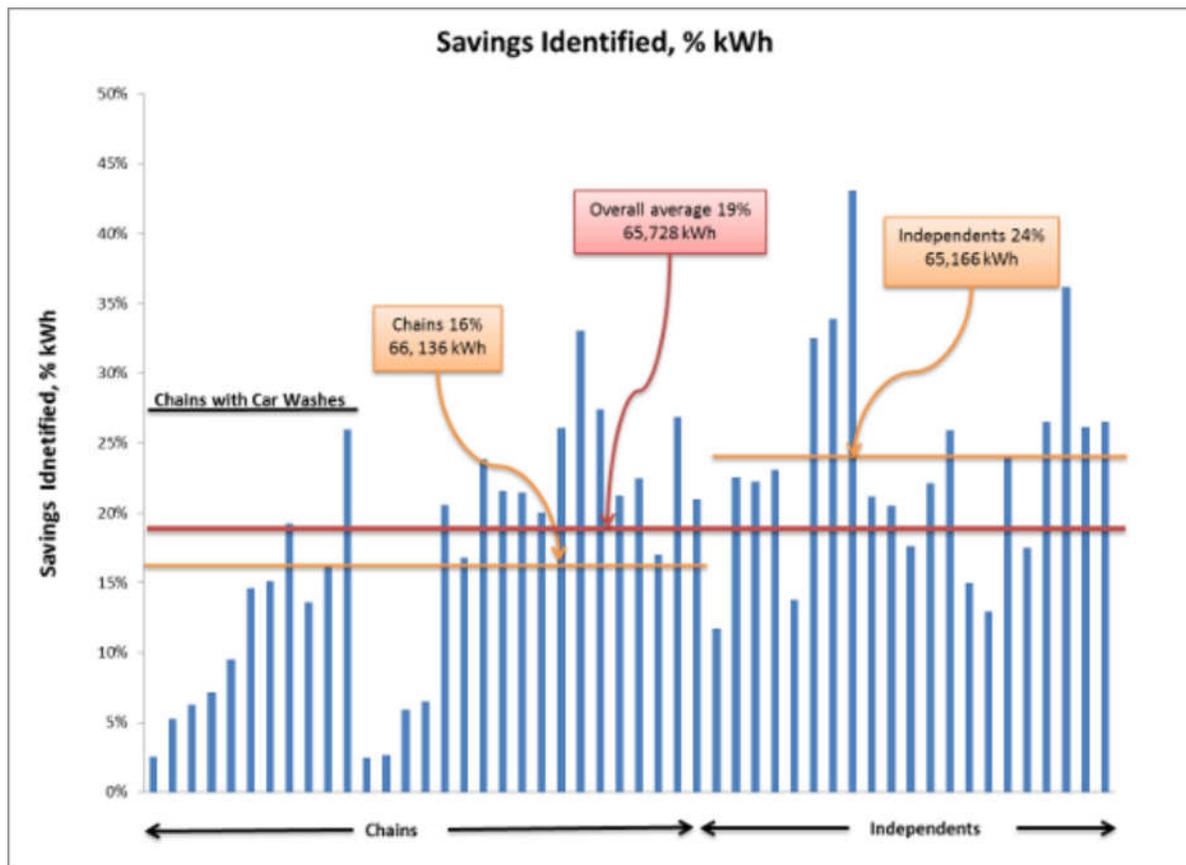


Figure 1: Savings Identified

Technology recommendations

Table 1 below shows top recommendations for convenience stores as well as the average store and statewide projected savings estimates based on the typical store in this study's participant pool. These opportunities generally fall into refrigeration systems, controls, lighting, and motors. The final report includes a table detailing cost effectiveness of specific measures. Lighting retrofits typically provided a payback of less than 3 years. Other measures, including controls and cooler motor upgrades, showed longer paybacks but nonetheless would be a wise investment given their long life.

There are approximately 2,000 convenience stores in Minnesota. If the energy efficiency measures identified in this study were implemented in all stores that had those opportunities, almost 120 GWh of energy and \$7.5 million would be saved by Minnesota businesses. In addition, this would reduce peak demand on the state's electrical system by about 21 MW.

Potential Savings across existing 2,000 C-Stores Statewide (50% open 24 hrs and 50% open 18 hrs)							
Efficiency Measures /Action	Store kW Savings	kWh Savings		% Opportunity	Statewide MW Savings	Statewide GWh Savings	Statewide \$ Savings
		24 hrs.	18 hrs.				
Lighting							
4 Wall Packs, 250W to 59W	0.9	4,135	2,067	72%	1.35	4.47	\$275,531
4 Parking Lot luminaires, 400W to 100W	1.4	6,220	6,220	38%	1.08	4.73	\$291,679
20 Gas canopy lights, 400W to 100W	7.1	31,098	15,549	86%	12.21	40.12	\$2,475,303
136 - 32W 4'T8s to 25W 4'T8 lamps	1.4	11,914	7,942	68%	1.85	13.50	\$833,097
Case lighting 9 coolers and 4 freezers - 85 to 20 watt	1.5	13,038	13,038	56%	1.67	14.60	\$900,994
Controls							
Occupancy Sensors for 2 restrooms and 2 storage rooms	0.0	2,801	1,868	88%	0.00	4.11	\$253,508
Anti-sweat Htr controls for 8 cooler @ 0.85 and 3 freezer @ 1.3 am	1.0	10,178	10,178	82%	1.69	16.69	\$1,029,908
Motors							
EC Motors for 4 freezer and 4 cooler exp fans @ 1/20 hp	0.7	5,984	5,984	74%	1.01	8.86	\$546,445
Refrigeration							
Floating Head Pressure Control - 4 hp walk-in freezer compressor	0.0	5,505	5,505	64%	0.00	7.05	\$434,763
Retrofit Measures Total	14.0	90,873	68,351		20.9	114	\$7,041,228
Maintenance Measures							
Install strip curtains	0.0	571	571	82%	0.00	0.94	\$57,778
Clean 2 Condenser Coils (4 hp freezer/3 hp cooler)	0.2	1,615	1,615	52%	0.19	1.68	\$103,633
Clean 2 Evaporator Coils (4 hp freezer/3 hp cooler)	0.2	1,599	1,599	52%	0.19	1.66	\$102,606
Maintenance Measures Total	0.4	3,785	3,785		0.37	4	\$264,018
Overall Totals	14.4	94,658	72,136		21.2	118	\$7,305,246

Table 1: Potential Savings Statewide

The study concludes that convenience stores are a compelling market sector to focus targeted energy conservation efforts. The uniformity of their conservation opportunities and the ubiquitous nature of convenience stores mean that most every electric utility in Minnesota could benefit from energy reductions in this sector.

Details of the program implementation process are given in the final report, "[Improving Energy Efficiency in Convenience Stores](#)," (pdf) available on the Commerce website. In addition to the final report, Michaels Energy will present the results of this study and discuss opportunities for utility conservation programs in a [free webinar](#). For more information on this CARD project, contact [Bruce Nelson](#) or CARD grant program administrator [Mary Sue Lobenstein](#) with any questions concerning this project.