



Solar powered retail: keeping supermarkets sustainable and profitable

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One of the fastest-growing and most promising commercial segments for solar energy applications is food retail. The logic is inescapable, with supermarkets consuming more electricity than almost any other retail sector. They need power 24/7 to preserve food in refrigerator and freezer cold cases, which can amount to more than 75% of their energy costs, estimated at around €182,000 per year per store. Plus there's lighting, air heating and cooling systems, air distribution systems, computer systems and everything else needed to create the perfect, come-back-for-more shopping experience.

Food retailers are also a daunting source of greenhouse gas emissions and a major contributor to global warming. According to the EPA, a typical 46,000 square feet supermarket uses 2,346,000 kwh per year, creating 1,383 metric tonnes of CO₂, equaling the pollution produced by 308 gas-powered cars in one year. McKinsey adds that '...the grocery sector has a unique opportunity to become the driving force for decarbonization of the entire food system.'

The customer shopping experience, which maps to customer loyalty, can make or break profitability, important since food retail is such a low-margin business, at less than 2%. According to a recent Retail Customer Brand Loyalty Study comparing retailer loyalty, consumers were 'significantly more inclined to name a *supermarket* as a retailer to which they were most loyal.' And more and more, loyalty is linked to sustainability. In a 2022 survey by Retail Insight, 67% of shoppers said grocery stores need to improve their sustainability practices and 55% responded that they would be more loyal to a brand perceived to be 'more green'.

So you can see why many of Europe's largest supermarket chains like Lidl and Sainsbury's are announcing carbon-neutral programs, with solar energy deployment as a key initiative.

Let's dive a bit deeper to see how solar energy can bring fresh ideas to food retail sustainability.

Distribution centers: a cool place to begin

The solar opportunity begins long before we step into the bright, air-conditioned supermarket. The grocery supply chain includes a network of distribution centers where 60% of energy demand stems from refrigeration.

These vast flat buildings with vast flat rooftops are of course the solar installer's dream come true. And their benefits extend beyond just generating free power. A European study on energy consumption in distribution warehouses noted that in addition to the corporate goals of reducing energy costs and meeting evolving environmental targets, customer loyalty was also strengthened with '...a kind of message for customers and the world that the business is environmentally friendly.'

In California, Kroger has installed a 7,000-panel system at its 555,000 square-foot automated distribution center in Paramount, followed by a 3,000-panel installation at its bakery installation in La Habra that is producing 2,009 MWh annually. In New Hampshire, Associated Grocers of New England (AGNE) chose ReVision Energy to build the largest rooftop solar installation in the state with a 1MW SolarEdge DC-optimized system. This SolarEdge system is forecast to offset about 20% of the building's energy consumption for the year, with an expected ROI in less than nine years.



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Balancing loads and managing consumption

As we are demonstrating here, basic PV for supermarkets is becoming ubiquitous, with impressive results from all over the world. A chain in Mexico is leveraging SolarEdge's Maximum Power Point Tracking (MPPT) technology to save a supermarket €68,000 in utility bills on a 500 kWp system. In Australia, a recent milestone was set by Woolworths with the installation of a 100kW solar system on its 150th store in Canberra. Supermercado Cristal, in Goiânia, Brazil, installed a 20 panel, 72 kWp



SolarEdge rooftop PV system at Italmark supermarket, Italy

SolarEdge system, in part to mitigate rooftop shading issues.

A typical supermarket has to contend with many factors that impact its profitability: energy prices that continue to rise, dynamic energy pricing, the uncertainty of future energy supply, grid outages (depending on where you're located), government legislation, and emissions reduction goals set by corporate sustainability programs. Now add to that the huge amount of incoming data that needs to be taken into account from all the store's various appliances and equipment, keeping in mind that anything related to cooling and freezing is also impacted by ambient temperature and humidity.

This is why at SolarEdge, we're developing our own advanced energy management solution that connects with all SolarEdge components to enable real-time optimization of energy production, consumption and storage, reducing customers' operational costs and increasing their profitability. It will concentrate all decision-making in one automated, AI-based platform, managed on the cloud, and configurable to match the specific behavior of each system user.

What aisle are batteries on?

Including storage in the onsite solar installation brings even more savings to the supermarket's energy program and increases self-consumption, especially when managed by an integrated EMS.

Excess produced solar energy is stored in a battery which serves two main purposes. First of all, using peak shaving, the EMS can instruct the solar system to charge the battery in preparation for upcoming peak periods of high utility rates, lowering electricity costs. Second, solar energy stored in the battery can be used when the sun has stopped shining to keep refrigerator and freezer cases humming, as well as other round-the-clock power-hungry applications.

Some of the major supermarket brands that have evaluated onsite solar storage include Sainsbury's and Aldi.

The heat is on to save money and reduce emissions

Global warming is driving up energy costs and supermarkets are especially vulnerable, plus, as we have mentioned, they contribute to GHGs. Warmer temperatures mean that refrigerator systems must work harder, and therefore use more energy to maintain their optimal cooling levels for meat, ice cream, frozen meals, drinks, fruits and vegetables.

A recent report created by Imperial College in London, working with Sainsbury's, has calculated that '...a 2°C increase on today's average UK summer temperature boosts the



SolarEdge PV inverters at Italmark supermarket in Italy

energy demand for refrigeration by 6 percent.' Extreme temperatures can also lead to grid outages which of course can be catastrophic to supermarkets without a generator or battery backup support.

Some of the steps supermarkets are taking to reduce both their energy needs and CO₂ emissions include improved monitoring and management of refrigerator and freezer compartments and more environmentally friendly cooling systems that replace hydrofluorocarbon (HFC) refrigerants with low-carbon refrigerants. Some are also turning off non-essential refrigerator cabinets during extreme temperatures and installing more energy-efficient lighting structures, such as LEDs.

As part of Sainsbury's ambition to become net zero across its own operations by 2040, the retailer contacted the cloud-based IoT and energy management platform Hark to improve its understanding of each store's energy usage and consumption patterns, with the goal of identifying where efficiencies can be made across 40 different asset groups.

The Hark hardware and software platform receives energy consumption data every 60 seconds with 368,640,000 readings now taken daily for the retailer. Hark's technology, so far, has detected anomalies that have saved Sainsbury's 4.5% of lighting asset costs alone by detecting problems and alerting the relevant people in real time.

Driving up customer loyalty with solar carports

Yet another win-win green energy initiative for supermarkets are solar powered carports. They not only provide additional roof space for energy production, but also enable EV car charging, which comes with a full cart of benefits.

Customer EV car charging, with fast and superfast charging speeds, can be offered free or at a discount to supermarket loyalty card members. Because the EV chargers can run on solar power, any revenue made from EV charging is pure profit. In an era where traditional supermarkets and hypermarkets are competing with online shopping plus convenience and specialty stores, any value-added service can influence customer loyalty. EV charging could cause shoppers to stay in the supermarket longer, buying more items. The EV charging stations themselves can be fitted with digital signage advertising daily promotions to loyalty card customers.

A few notable examples of supermarkets offering EV charging include Tesco, Asda, Lidl, and Fred Meyer. France's Carrefour is adding 3,000 solar-powered EV charging stations to its existing 2,000, making it France's #1 electric charging network. This includes a 22 kW 'comfort' charging service that loyalty card or Carrefour PASS cardholders get for free for the first hour.

The future in groceries is green

There are still many exciting opportunities to explore in solar for supermarkets. Almost all of the world's leading food retail chains are embracing renewable energy solutions to reduce OPEX, meet emission reduction goals and keep their customers coming back.

The future looks especially bright. As solar technology continues to advance with algorithm-based energy management systems that align energy production and storage with the store's consumption patterns and budget goals, we should see supermarkets transforming from environmental hazards to environmental heroes.

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