+ E-BOOK

Solar-Plus-Storage for the Food & Beverage Industry

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The food and beverage industry is essential to daily life, powering everything from processing plants and bottling lines to cold storage warehouses, distribution centers, and retail operations.

But keeping the supply chain running comes with significant challenges: massive energy consumption, volatile electricity costs, and the constant threat of power disruptions that can lead to spoilage and costly downtime.

Clean energy technologies offer a powerful solution to these challenges. Food and beverage facilities that invest in solar arrays and battery energy storage systems unlock substantial financial, operational, and environmental benefits — helping them protect their bottom line while advancing sustainability goals.

This e-book explores the energy challenges food and beverage companies face, the specific benefits solar-plus-storage delivers, and how PowerFlex can help facilities implement and optimize integrated solutions.

Food & Beverage Energy Challenges

The food and beverage industry contends with an exceptionally demanding operating environment. From production lines to temperature-controlled storage and time-sensitive distribution, every stage of the value chain depends on a steady flow of power. However, there are significant challenges in terms of the volume, cost, and reliability of the energy that food and beverage companies consume.

Large Power Demand

Food and beverage facilities are among the heaviest energy users in the commercial and industrial landscape. High base loads come from refrigeration and freezing equipment, HVAC systems, compressed air, conveyors, and process heating or cooling. Many companies run multiple shifts or operate

around the clock to meet production targets and manage logistics, which keeps power demand high nearly all day, every day.

Cold storage sites are particularly power-hungry; they must maintain strict temperature ranges at all times to protect product quality and safety, leaving little room to reduce consumption without affecting core operations.

Climbing Energy Costs

As facilities consume more power, they are increasingly exposed to volatile and rising energy costs. Electricity is often a significant operating expense for food and beverage manufacturers, distributors, and retailers. In many utility territories, time-of-use (TOU) rates and steep demand charges amplify this burden by penalizing facilities for drawing power during peak hours or spiking demand.

Common operating patterns such as simultaneous equipment startups, refrigeration defrost cycles, and seasonal cooling loads can unintentionally drive up bills. In a sector where margins are tight and pricing pressure is constant, this volatility makes it difficult to forecast budgets and protect profitability.

Power Disruptions & Product Loss

Beyond cost, reliability is a critical concern. Power outages can quickly lead to spoilage in cold and frozen storage, forcing companies to dispose of high-value inventory. Interruptions also carry food safety risks, as facilities must carefully track temperature excursions and maintain compliance with strict regulatory standards.

Even brief outages can result in scrapped product, time-consuming restarts of production lines, and missed delivery windows, all of which strain relationships with retailers and foodservice customers. For brands that depend on consistent product availability and quality, the operational and reputational risks of grid disruptions are significant.

Carbon Footprint

Beyond direct operational costs and reliability concerns, the food and beverage industry faces increasing scrutiny over its environmental impact. Up to 37% of the globe's total annual greenhouse gas emissions are

attributed to the food system. This immense footprint stems from every stage of the supply chain, including energy-intensive processing, refrigeration, transportation, and waste management.

As consumers, investors, and regulators demand greater accountability, food and beverage companies are under pressure to decarbonize their operations and supply chains, making the transition to cleaner energy sources an urgent priority.

The Benefits of Solar-Plus-Storage for the Food & Beverage Industry

The food and beverage industry's biggest energy challenges are exactly where solar-plus-storage can make a measurable difference. By generating clean power onsite and using batteries to manage when and how that power is used, facilities can reduce costs, improve reliability, and demonstrate progress toward sustainability goals without compromising operations.

Utility Offset

Food and beverage facilities run energy-intensive operations around the clock, so even modest reductions in grid draw can translate into significant savings over time. Rooftop or ground-mounted solar arrays can supply a substantial share of annual electricity consumption, particularly for daylight-driven processes and cooling loads that are hardest on utility bills.

For cold storage facilities and distribution centers with large, flat roofs, rooftop solar systems can offset a meaningful portion of grid usage with predictable, low-cost energy. By locking in a portion of their power supply at a stable rate, operators gain a long-term hedge against future price spikes and regulatory changes in the utility market. Solar also layers neatly on top of existing efficiency investments such as high-efficiency refrigeration and LED lighting, amplifying the impact of every kilowatt-hour saved.

Cost-Saving Strategies With Storage

Batteries extend the value of solar by helping facilities control when they buy electricity from the grid and how their demand appears to the utility. This directly addresses the volatility and demand-charge exposure that make energy such a difficult line item to manage. Common storage-enabled strategies include:

Solar Shifting: If solar panels generate more electricity than the facility consumes (a common scenario on sunny days) the surplus can be stored in batteries rather than fed into the grid. That stored energy can then be used later in the day to support evening production shifts, early-morning equipment ramp-ups and pre-cooling cycles, or hot-weather periods when refrigeration loads surge. By doing so, a facility can reduce its reliance on grid power at times when rates and demand are typically highest.

Energy Arbitrage: In many territories, electricity prices change throughout the day based on grid conditions. Batteries enable food and beverage facilities to charge when rates are low, or when solar generation exceeds current needs, and then discharge during high-price windows when production, warehousing, and logistics activities are still running. This strategic load shaping directly tackles the budget instability created by fluctuating utility prices.

Peak Shaving: Demand charges can make up a big share of monthly bills, especially for facilities with large, motor-driven loads. Batteries can discharge during brief spikes — such as simultaneous compressor starts, conveyor ramp-ups, or stacked refrigeration loads — to keep measured demand below costly thresholds. By flattening their load profile, large warehouses, bottling plants, and cold storage facilities can significantly reduce demand charges without altering core operations.

Net Metering (Where Available): In some markets, exporting excess solar or stored energy to the grid for bill credits can provide additional economic value. However, as net metering rules evolve and compensation declines in several states, using stored energy to offset high-cost consumption often delivers more consistent and controllable savings, especially for facilities with steady, 24/7 loads.

Revenue Opportunities

The same flexibility that helps food and beverage facilities manage bills can also open new revenue streams. In regions with demand response or grid services programs, utilities and grid operators pay customers who can reduce grid strain during peak events.

For battery storage customers, participation may involve automatically discharging stored energy to support the grid at specific times, while the facility continues operating normally. In some cases, operators can also temporarily curtail non-critical loads in coordination with battery dispatch (for example, slowing nonessential equipment) without jeopardizing product quality or safety.

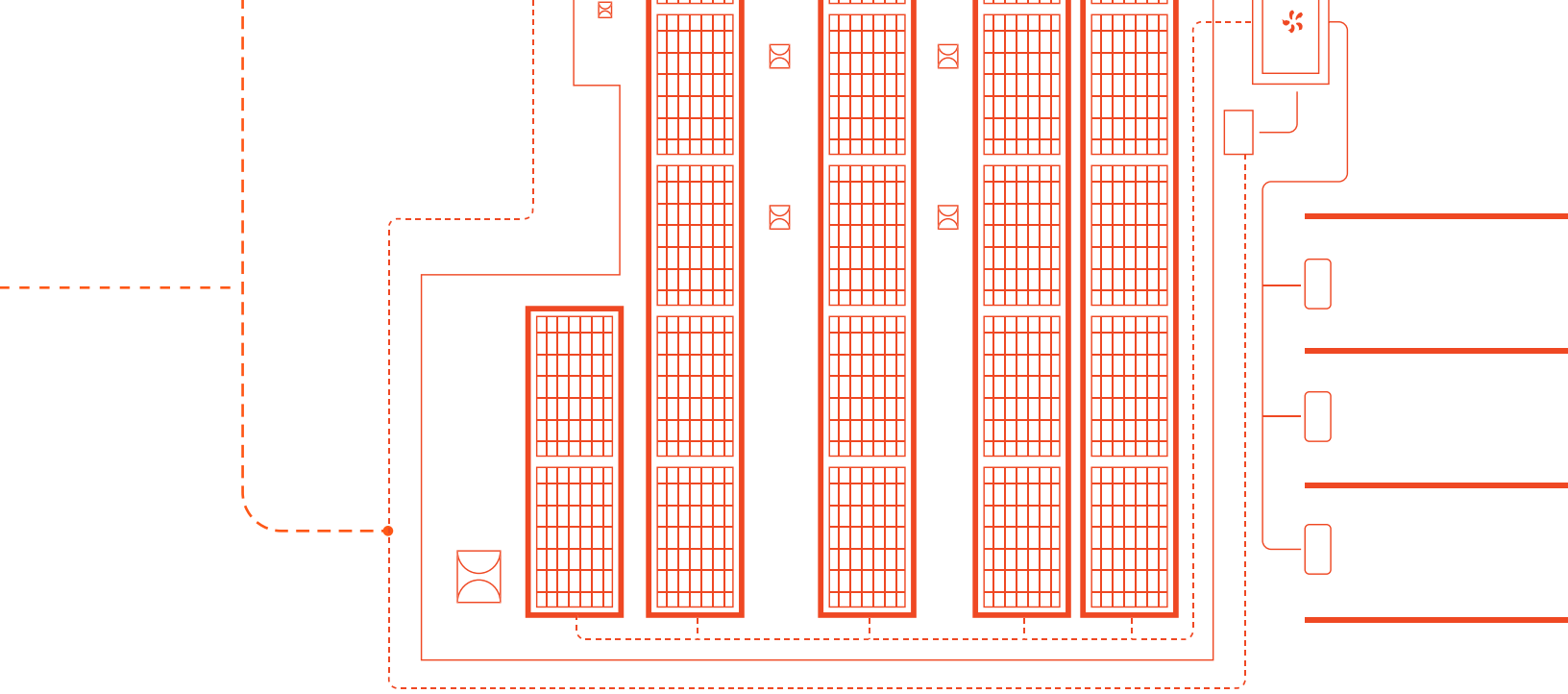
Demand response programs provide meaningful payments per kilowatt of flexible capacity during peak events. For food and beverage companies, this is an opportunity to turn energy flexibility into additional revenue that helps fund operations.

Reduced Emissions

Many food and beverage brands are under increasing pressure to demonstrate credible progress on emissions targets — not just in packaging and sourcing, but also in how products are manufactured, stored, and distributed. Solar-plus-storage provides a direct pathway to lower Scope 2 emissions by reducing reliance on grid electricity from fossil fuels.

By using onsite solar generation and stored clean energy to power their operations, companies can demonstrate clear, quantifiable reductions in greenhouse gas emissions. These gains can be integrated into science-based targets, annual sustainability reports, and retailer or investor scorecards.

In addition to the numbers, solar arrays and clean energy systems are highly visible proof points. Panels on rooftops or solar canopies over parking lots offer compelling stories for customers, employees, and communities, reinforcing brand narratives around responsible production, healthier supply chains, and long-term climate commitments.



Energy Resilience and Product Protection

The risks of power disruptions are uniquely acute in the food and beverage sector, as outages can quickly lead to temperature fluctuations, product spoilage, and costly production interruptions. Solar-plus-storage reduces vulnerability by providing a controllable source of onsite power that can be prioritized for mission-critical loads.

When integrated into a microgrid, solar and storage systems keep essential equipment running even when the grid goes down. Batteries can bridge gaps between solar production and generator use, or allow generators to run more efficiently and less frequently, extending fuel reserves during extended outages.

This layered approach to resilience helps companies avoid product loss, maintain supply reliability to retailers and food-service customers, and reduce the operational and reputational damage that can result from repeated disruptions. In an industry where freshness, safety, and on-time delivery are non-negotiable, the ability to ride through grid events can be as valuable as the day-to-day cost savings.

Together, these benefits show how solar-plus-storage directly responds to the industry's toughest energy challenges, turning high demand, cost volatility, and outage risks into opportunities for lasting savings, resilience, and sustainability leadership.

Why Food & Beverage Facilities Are Suited for Solar & Storage Deployment

The operational benefits of solar and energy storage are very much within reach for food and beverage facilities, as they tend to be prime candidates for asset deployment.

Ideal Site Characteristics

Large distribution centers, bottling plants, processing facilities, and big-box retail stores typically have large, flat rooftops with consistent sun exposure. These roofs are ideal for high-capacity rooftop solar panels paired with ballasted racking that minimizes roof penetrations and simplifies installation.

Solar infrastructure turns underutilized roof space into energy-producing assets that generate value for decades. For multi-site operators, these characteristics create opportunities for phased rollouts across entire facility portfolios.

Ample Site Space

Many food and beverage campuses, cold storage hubs, and distribution centers sit on large parcels with adjacent land suitable for ground-mount solar arrays, including brownfields or other low-value land. These sites also offer space for containerized battery systems and associated equipment, with the flexibility to position batteries near electrical rooms for operational efficiency.

Aligning Clean Energy With Operational Realities

Importantly, solar-plus-storage aligns naturally with the daily operations of the food and beverage segment:

- Cold storage operations benefit from continuous load coverage, strong resilience, and relief from high-demand charges.
- Processing and manufacturing facilities with day-biased production schedules and predictable energy use patterns can maximize solar utilization.
- Distribution and logistics operations can cover lighting, conveyor, and dock operations with solar during peak shipping windows.

By seamlessly integrating with these diverse operational needs, solar-plus-storage empowers food and beverage companies to optimize energy use without compromising efficiency or product integrity.

Get the Most Out of Solar-Plus-Storage With PowerFlex

Solar and energy storage systems aren't one-size-fits-all. It takes an experienced project developer to understand your load profile and design a system that will meet your specific energy and operational needs.

As a leader in clean energy solutions, PowerFlex is ready to help food and beverage companies like yours implement solar-plus-storage efficiently and cost-effectively.

End-to-End Services

PowerFlex manages the full project lifecycle with a commitment to quality and technical excellence:

- Our feasibility studies consider structural loads, roof age, and refrigeration and electrical infrastructure to ensure systems are correctly sized and integrated.
- System designs are tailored to cold storage and process loads, existing backup systems, and power quality requirements.
- Throughout construction and commissioning, we minimize disruption to ongoing production, warehousing, and logistics operations.
- Long-term asset management sees that your system runs smoothly and generates a return on investment.

Incentive & Policy Expertise

Our specialists work with customers to navigate federal, state, and utility incentives — including the Investment Tax Credit, state-level solar and storage rebates, and demand response programs. Given the short application windows for many of these opportunities, having an experienced partner can mean the difference between securing significant savings and missing out entirely.

PowerFlex helps food and beverage operators optimize project economics across diverse geographies and utility territories, making sure customers capture every incentive dollar to which they are entitled.

Flexible Financing

PowerFlex offers financing models that make solar-plus-storage accessible regardless of capital constraints. Our team takes a consultative approach to align on an arrangement that makes the most sense for your business.

> **Direct Purchase:** Customers own the solar and storage assets, capturing the full value of tax credits, depreciation, incentives, and long-term utility savings. This option is best suited for organizations with strong balance sheets and tax capacity seeking maximum long-term ROI.

Third-Party Options: Power Purchase Agreements (PPAs) allow PowerFlex or an affiliate to own and operate the system while the customer buys energy at a contracted rate typically below utility prices, with minimal or no upfront cost.

Solar and storage leases offer fixed payments structured to meet specific budget or accounting objectives. These options preserve capital for core business investments, such as equipment, automation, and expansion, while still achieving energy and ESG goals.

Hybrid & Co-Ownership Structures: Shared ownership or structured arrangements allow multi-site operators to mix and match financing models across plants, distribution centers, and retail sites based on local incentives, tax capacity, and internal capital priorities, optimizing portfolio-wide economics.

Proven Technology

As an all-in-one solutions provider, we pride ourselves on exceptional hardware and software that maximize operational and financial performance. We access dependable supply chains and competitive pricing through our deep global industry relationships — procuring quality panels, racking, inverters, batteries, enclosures, and other vital solar and storage components.

On the software side, our energy optimization platform, PowerFlex X™, optimizes solar production and battery operation to maximize cost savings, resilience, and program participation. The platform co-optimizes solar and storage with other onsite energy assets like EV chargers and provides site- and portfolio-level visibility into cost savings, emissions reductions, and system performance.

Customer Success

PowerFlex has delivered proven results for leading food and beverage operators across distribution, cold storage, and premium branded products. Our customers include:

UNITED NATURAL FOODS, INC. (UNFI)

UNFI is the largest publicly traded wholesale food distributor in the U.S. and Canada, operating nearly 50 distribution centers and supplying more than 30,000 customers, including major grocery chains.

For UNFI's facility in Howell, New Jersey, PowerFlex designed and installed a 3.2-megawatt (MW) rooftop solar energy system that generates approximately 3.8 million kilowatt-hours (kWh) of clean electricity annually — enough to fulfill nearly all of the building's yearly energy needs and deliver significant cost savings. The system also prevents almost 3,000 tons of CO_2 from entering the atmosphere each year, advancing UNFI's ESG commitments.

PowerFlex and UNFI teamed up on a second major rooftop solar project, at UNFI's Riverside, California distribution center. The 6.8-MW system generates over 10 million kWh of clean energy annually, helping the facility reduce reliance on price-volatile utility power while advancing UNFI's sustainability goals.

PREFERRED FREEZER SERVICES

PowerFlex partnered with Preferred Freezer, one of the nation's largest cold storage warehouse providers, to deploy a portfolio of rooftop solar systems totaling 16.4 MW across 10 sites in California, Massachusetts, New Jersey, and

Illinois. Together, these systems generate more than 10 million kWh of clean electricity annually, substantially reducing reliance on price-volatile grid power.

By leveraging state-level Solar Renewable Energy Certificate (SREC) markets and other incentives, Preferred Freezer maximized financial returns while avoiding roughly 7,000 tons of greenhouse gas emissions each year.

DOMAINE CARNEROS

Extended outages forced Domaine Carneros, an award-winning winery in Napa Valley, to rely on diesel backup generators and compete for limited fuel supplies — a serious risk to both operations and brand reputation.

To address these challenges, Domaine Carneros partnered with PowerFlex to implement a renewable microgrid that combines carport and ground-mounted solar, battery energy storage, and EV charging.

During normal operations, the microgrid reduces utility costs by shifting and offsetting grid consumption. During outages, solar powers the facility by day, while the battery provides energy at night, with a diesel generator available as a supplemental backup that now runs far less frequently.

The microgrid has reduced greenhouse gas emissions during outages by 65%, doubled onsite fuel reserves, and is expected to save approximately $70,000 annually in utility costs — translating to an estimated $1.5 million over the system's lifetime.

Talk to a PowerFlex expert today to learn more about what solar-plus-storage can do for your food and beverage business.

About PowerFlex

PowerFlex is a clean technology solutions company making the transformation to carbon-free electrification and transportation possible. Our adaptive energy optimization platform PowerFlex X™ monitors, controls, and co-optimizes onsite assets like EV chargers, solar, energy storage, and microgrids — reducing overall energy costs through patented algorithms that maximize distributed energy resources.

PowerFlex is the second-largest installer of commercial solar in the United States, with over 500 megawatts (MW) of total solar capacity plus 50+ megawatt-hours (MWh) of battery energy storage. Combined, our solar and energy storage projects offset 460,000 metric tons of CO_2 each year. We also manage more than 50,000 EV chargers nationwide, making us the second-largest EV charging provider in the U.S. in terms of Level 2 port management.

PowerFlex is backed by EDF power solutions and Manulife Investments.

Visit powerflex.com for more information, and connect with us on LinkedIn and YouTube.

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