

Anatomy of a Microgrid Island Mode Event

ShopRite — Long Island, NY



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When a 26-hour utility power outage occurred at a ShopRite in Long Island, NY, the disruption could have been costly. Instead, the store's microgrid, which powers the store year-round, offered energy resiliency by entering island mode and fully supporting the store's operations during the outage.

It is late August and a ShopRite store in Long Island, NY, is bustling with activity. With the work day over, shoppers are buying supplies for day trips to the beach, the upcoming Labor Day weekend, and even the busy back-to-school season. The store's refrigerators are well-stocked and the lines at the cash registers are long.

But outside, a thunderstorm is rolling into the area. At 6:34 PM, the first lightning strike cracks. At 7:04 PM, storm winds knock an oak tree onto the utility power

lines, creating a ground fault that immediately cuts off power to the ShopRite and neighboring buildings.

This is the type of situation that grocery store owners dread. Stores that are powered solely by the utility are at the mercy of grid outages. As the minutes tick by, the risk of spoiled products and lost sales grows rapidly.

But this time is different. This ShopRite has a microgrid designed for resilience and capable of entering island mode during grid failures. The Unison Energy microgrid, which provides 99% of the store's power needs throughout the year, typically runs in parallel with the utility and load follows the site's electric demand. When the outage occurs, the microgrid shifts seamlessly into island mode and ensures the ShopRite continues operating as usual.

Utility Power — *What typically happens*

Wednesday, August 21

7:04:13 PM

The store lights abruptly cut out. Seconds later, the emergency lighting clicks on.



7:05 PM

Some customers continue shopping in the half-lit store for non-refrigerated goods, but any new customers just arriving are asked to leave by the store's staff. The store's emergency lighting doesn't meet federal safety standards.

Unison Energy Microgrid — *What happened this time*

7:04:13 PM

The lights don't even flicker.

110 milliseconds after the outage, the drop in utility voltage triggers the interconnection relay, tripping the microgrid's breaker and disconnecting the store from the grid.

The on-site generators, already running in parallel with the utility, continue running as the microgrid automatically transitions to island mode.

7:04:14 PM

Once fully disconnected from the grid, the on-site generators power the store's single-phase circuits. The master controller's load-shed logic signals the pre-programmed circuits to turn off the HVAC refrigeration systems' large motor load, allowing the generators to stabilize the microgrid's load.

7:04:43 PM

The load is stabilized and the master controller initiates the load-adding process, activating the HVAC and refrigeration circuits in sequence.

These circuits power large rotating equipment, such as refrigeration compressors, which must be slowly ramped up to full speed.

7:04:47 PM

The Unison Energy technician responsible for the site sees the automated alert within Unison's proprietary communication system. He posts "en route to site" and heads over to provide on-site support if needed.

7:07:48 PM

The store's HVAC and refrigeration systems are fully repowered and running at full capacity.

Utility Power

7:08 PM

Power has yet to return to the store. After calling the utility repeatedly and not getting through due to high call volume, the store's manager asks all remaining customers to leave. The manager then enacts emergency procedures to prevent refrigerated goods from warming up:

- All staff help shift refrigerated products from open-air cases to cases with doors, starting with high-value meat and seafood.
- The store's limited (and expensive) dry ice supply is added to cases storing high-value goods.
- All refrigerated cases are locked to prevent customers from letting in warm air.



9:35 PM

The temperature in some refrigerated cases has surpassed the limits mandated by the FDA — over 40°F for two or more hours. Staff begins the process of throwing out thousands of dollars of perishable items. Less-than-full fridges warm up the quickest, so these goods are discarded first.

11:15 PM

Staff throws out some frozen goods, like melted ice cream. Goods in insulated freezers are left until the next morning, as they can hold a safe temperature for up to 48 hours as long as the doors are kept closed.

Unison Energy Microgrid

7:08 PM

The microgrid island is fully formed and stabilized. Now the on-site generation will run in load-following mode to cover all of the facility's electrical and thermal needs, for as long as the utility outage persists.

7:08 PM

The Unison Energy team calls the store manager: "We are monitoring the utility outage and saw the system successfully transition into island mode. A technician is on the way to provide additional support and ensure all systems are operating normally."

The store manager, surprised by the news of an outage, peers outside through the rain and sees that the entire block is without power.

7:56 PM

The Unison Energy technician arrives and posts on Unison's internal communications platform that he is now "on site." This alerts the remote monitoring team that he will handle any system alerts and is actively managing the generators to avoid any safety issues.

Meanwhile, ShopRite customers continue shopping, unaware that a power outage has occurred. New customers continue to arrive, as ShopRite is the only store in the area with power.



11:30 PM

After five hours on standby, the technician leaves his cell phone number and heads to a nearby hotel. He alerts the 24/7 monitoring team that he is off site, so they should monitor system conditions and restart the engine remotely if engine faults occur.

Utility Power

Thursday, August 22

5:00 AM

Much of the dry ice has evaporated and some cases of high-value refrigerated goods have exceeded the 40°F threshold. Products that no longer have visible ice crystals can't be refrozen and must be discarded. Well over half of a million dollars of refrigerated goods have been lost overnight.

7:00 AM

The store remains closed.

11:13 AM

The store lights turn on and the remaining staff breathes a sigh of relief as the HVAC and refrigeration kick on.

11:28 AM

A severe phase imbalance on one of the utility feeders damages the store's three-phase equipment — irreversibly damaging one refrigeration compressor. The power shuts off again, to the frustration of the staff.

2:52 PM

Utility power returns and is stable for 15-20 minutes. The store's equipment operator tests equipment for electrical damage caused by the phase imbalance. He chooses to keep the refrigeration circuit turned off to prevent it from being further damaged by power quality issues.

3:22 PM

The grid's power quality issues continue, as the lights flicker on and off in the store.

4:46 PM

The store staff alerts their distributor to ship replacement refrigerated and frozen products. Additional stocking staff is called in, many on overtime, after a night spent shifting around and then throwing out spoiled product.

7:12 PM

As goods arrive, the staff begins stocking the refrigerated cases — a task that could require another 24 hours of labor.

Unison Energy Microgrid

5:30 AM

The Unison Energy technician returns to the site, alerting the monitoring team again, to perform regular engine and system checks. He checks in again with the store manager to assure him that everything is operating as intended.

7:00 AM

The store opens, and the day's first shoppers are able to make purchases as normal.

11:15 AM

The remote monitoring team, which has been monitoring the microgrid's on-site controller, alerts the technician that utility power is restored but the three phase voltages are unstable.

The technician discusses the situation with the store manager and they choose to leave the store in island mode while they continue to monitor the utility's supply voltages.

3:34 PM

Unison Energy contacts the local utility, which requests that the store remain in island mode while they work to stabilize their system voltages. The lessened load on the utility feeders will ease the utility's troubleshooting process.

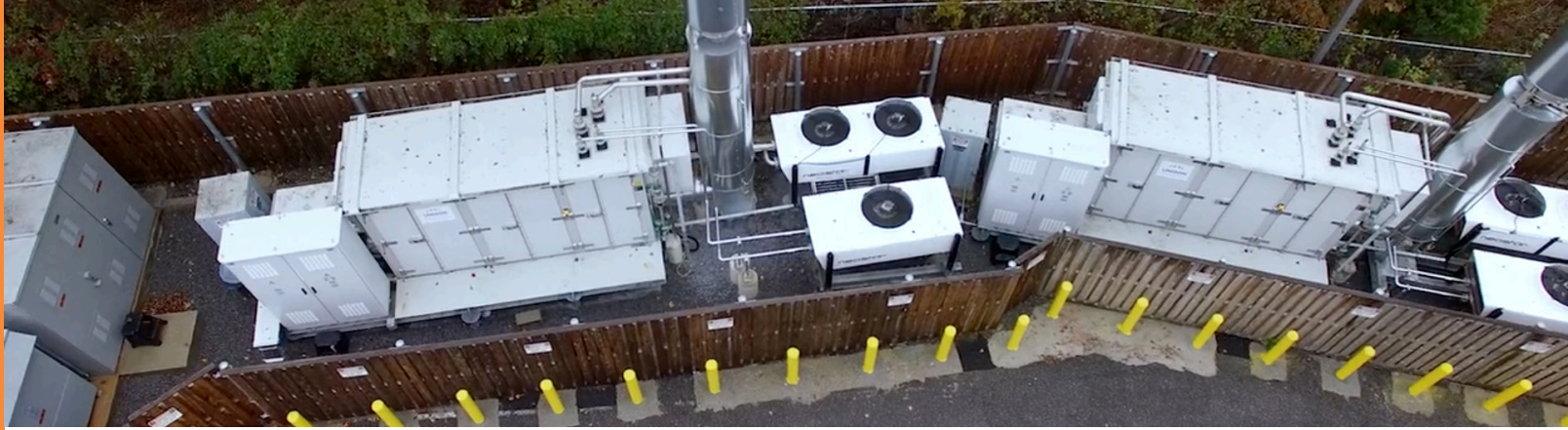
4:00 PM

A second Unison Energy technician arrives and takes over monitoring duties at the site so that the first technician can end his shift.

9:48 PM

Unison Energy receives permission from the utility to reconnect to the grid. Unison's own monitoring of the utility's power quality over the past several hours confirms that the local grid is stable.

Unison Energy's remote operating center dispatches a signal to close the interconnection breaker, ending the island mode event.



Utility Power

Friday, August 23

7:00 AM

The store finally reopens and resumes business operations with limited inventory, while restocking continues. The store owner begins the lengthy insurance claim process to help recoup losses. Unfortunately, the policy will not cover the two days of lost revenue and customer goodwill.

Unison Energy Microgrid

7:00 AM

The store opens as usual, ready to serve the community.

This was just one of 19 island mode events that Unison Energy managed for its clients in 2019 lasting two hours or more.

The On-Site Generation Difference

On August 21, the microgrid seamlessly transitioned to island mode the instant the outage occurred and powered the store in island mode for over 26 hours. Considering the alternative scenario, on-site generation with island mode capabilities saved the ShopRite store:

- Over \$1 million in perishable refrigerated goods
- At least one refrigeration compressor
- Reduced lifetimes for the three-phase motors degraded by power quality issues

In addition, customers were able to continue shopping over these two days, ensuring the ShopRite did not experience additional losses in revenue. With the Unison Energy microgrid in place, ShopRite's owner-operator and staff have peace of mind knowing their energy supply is resilient, reliable, and secure.

"It's nice to know that you can work your day, go home, and if there's a storm, you have peace of mind — for our associates, for our product, for the customers who are coming in and shopping. It's a major relief."

— Melissa Buonadonna, ShopRite Owner-Operator

For more information on how island mode can protect your business from disruptions and financial losses due to grid outages, contact Unison Energy at sales@unisonenergy.com or visit unisonenergy.com.