



Case Study: SUPERVALU Energy Management

*Energy monitoring system for
grocery retailer manages
demand-response program*

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Energy monitoring system for grocery retailer manages demand-response program

OVERVIEW

Unlike other essentials such as food or water, large-scale electrical power cannot be stored; it must be used as it's generated. In order to anticipate customers' needs and have electricity available for them exactly when and where it's needed, power utilities need to understand their customers' demand and their consumption patterns.

At the same time, opportunities in the energy market are prompting industrial facilities and other companies to implement technologies and initiate programs that save them money through smart purchasing strategies, effective energy management, and energy curtailment.

Some of these same companies are also profiting by effectively "selling" their electricity back to their utilities when demand is high.

Minnesota-based grocery retail company SUPERVALU (www.supervalu.com) has deployed energy monitoring hardware and has partnered with a leading curtailment service provider (CSP) and a systems integrator specializing in refrigeration to reduce overall energy consumption in its distribution centers and make them more energy efficient. SUPERVALU's management team has worked with this same CSP to identify imbalances in electrical supply and demand in order to gain best pricing for electricity, and payments and incentives for energy curtailment.



SUPERVALU

SUPERVALU is one of the largest companies in the grocery industry, serving customers through a network of store brands that include ACME, Farm Fresh, Shoppers, CUBS, Jewel-Osco, and Albertsons.

SUPERVALU is also one of the most environmentally conscious organizations in the food industry, which was evident in the company's stated goal to cut emissions of greenhouse gases by 10 percent by the end of 2012. Richard Druce, Director of Facilities Maintenance at SUPERVALU, says that among other initiatives, the company is focused on reducing energy consumption in the company's distribution centers, each of which encompasses 40,000-500,000 square feet of refrigerated space. Two of these facilities are located in the Pennsylvania towns of New Stanton and Denver.

"These facilities each have refrigerated space with operating temperatures ranging from -12 to 55 degrees," says Druce. "Approximately fifty percent of the energy consumption of these facilities is due to their refrigeration systems."

Energy Monitoring for Demand-Response

Recognizing an opportunity to cut costs while also becoming a "greener" and more sustainable company, SUPERVALU enrolled in a demand-response program. The company worked closely with Net Peak Energy Group, LLC (www.netpeakenergy.com), which serves as an energy data aggregator and curtailment services provider.

Net Peak works with several customers, gathering and analyzing energy usage data so their electrical power sourcing, purchasing, and transmission can be better coordinated and optimally priced. Net Peak also helps businesses match their loads with the various demand-response programs available, helps businesses meet their sustainability goals, and distributes any demand-response payments due.

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“SUPERVALU’s demand-response program is multi-faceted,” says Net Peak General Manager Fred Krumberger. “By participating in a ‘capacity’ program, the company agrees to a potential interruption in service up to 10 times per year. In most service areas, however, companies experience no emergency interruptions.”

Krumberger says that capacity programs currently offer payments between \$40,000 and \$60,000 per megawatt hour, and that customers receive their payment even if their capacity is never actually reduced. If there is an emergency curtailment, the power grid operator compensates the company in the range of \$900 – \$1,000 per megawatt hour for the curtailment period.

“The emergency energy [curtailment] program in which SUPERVALU participates calls for its distribution centers to shed up to 1.2 megawatts of power,” says Net Peak’s President Mike Verkuynen. “We’re typically able to provide one to two hours of advanced notice to initiate the emergency load shed.”

Net Peak provides this and other notifications through its network operating and dispatch center located in Green Bay, Wisconsin. Here, NetPeak’s Dispatch Specialists use custom designed interfaces for real-time monitoring of SUPERVALU’s energy consumption.

Detailed energy data comes from a hardware appliance called an OptoEMU Sensor. Developed by Opto 22 (www.opto22.com), a manufacturer of products for industrial-grade automation and remote monitoring applications, the OptoEMU Sensor provides the physical connections needed to remotely monitor and acquire real-time energy data from a variety of systems, equipment, and metering devices, and then sends the data to network databases and Web-based applications.

At SUPERVALU, the Sensor monitors both pulse-emitting devices (such as utility meters and sub-meters) and the voltage and current of several load panels, chillers, and refrigeration units. All communication takes place over the

Internet via standard TCP/IP, providing a simple and standards-based way to interface to the monitoring hardware in Pennsylvania.

Net Peak also tracks weather and other events affecting the energy market, including the real-time market price of electricity. As energy demand peaks, market prices rise, and when SUPERVALU’s agreed upon price is reached, curtailment begins.

The process works very much like a broker operating in the stock market. Net Peak works with its client companies to identify how much they’re paying the utility for electricity and then recommends an optimal “strike price,” which is the point where the individual customer’s load shed begins. Krumberger says that these types of economic curtailments are typically much shorter than emergency curtailments.

“During periods such as this, the payments received for curtailment essentially amount to ‘selling’ electricity back to the power grid operator. If, for example, we have a customer that pays \$50 per megawatt hour for its electricity, and the market price rises to two, three, or even four hundred dollars a megawatt hour, the business would want to capitalize on a price that high.

“By monitoring real-time market prices—and working within the pre-arranged dispatch rules and strike prices established in conjunction with the company’s engineers and operators—we’re able to generate revenue for the customer.”

Automated Response Technology

But monitoring is only one part of the energy-saving and cost-cutting equation. Once notified by Net Peak, SUPERVALU needs to quickly take action and begin curtailment, which means they need technology in place that will provide an automated response to curb power demand.

Because the heaviest energy consumer in these facilities is the refrigeration equipment, systems integrator Advanced Energy Control (AEC) was brought in. AEC is an industrial controls company whose areas of expertise include refrigeration control, HVAC, and building management systems. AEC designed and implemented a hardware system programmed to intelligently control SUPERVALU’s entire refrigeration system during peak demand periods.

“Net Peak had been providing demand-response revenue for SUPERVALU for about a year,” explains AEC’s Nathan

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SUPERVALU monitors power consumption in its distribution centers to be more energy efficient and to ensure it meets its demand-response objectives.

Bartlett. “We were brought in to design and build a system that provided better sequencing of the refrigeration system and broader, more comprehensive, and more powerful demand-response automation in general.”

To achieve such precise levels of control and automation, AEC installed additional Opto 22 components. The company’s SNAP PAC System (programmable automation controllers and I/O) utilizes integrated circuit temperature detector (ICTD) sensors to monitor temperatures, plus analog and digital output signals to expertly manage compressors, control solenoids on evaporators, switch relays, and otherwise provide immediate response to the Net Peak dispatch center’s demand-response trigger.

Bartlett says that the AEC-designed control system can provide interfaces to any piece of industrial-grade equipment imaginable. In this case, the system handles about 1500 inputs and 500 outputs, enabling full demand-response automation of SUPERVALU’s industrial refrigeration, ventilation, and soon, even the HVAC and lighting systems.

At the same time, the control system also carefully maintains specific refrigeration temperatures and is

programmed to send alerts if these ever deviate from a predefined range. This ensures that food is always stored and preserved properly and no spoilage occurs.



The OptoEMU Sensor and other SNAP PAC System hardware is wired to SUPERVALU’s refrigeration system components and gathers consumption data. This data is then made available to both the company and curtailment service provider Net Peak.

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Demand-Response

Increasingly, utilities are offering demand-response programs to their customers. With demand-response, utilities essentially pay businesses for reducing their energy consumption during specified times of peak demand. In some cases, the customer receives additional payments just for being part of the program.

Customer benefits

Curbing energy consumption is one of the fastest and greatest opportunities for cost savings. Indeed, large businesses are learning that the revenue they can generate through demand-response is too great not to be pursued. The study *Efficiency and Innovation in U.S. Manufacturing Energy Use* noted that many manufacturing plants can easily reduce their energy consumption by ten to twenty percent.¹ According to the report, a large portion of this reduction can be obtained without significant capital expense.

Utility benefits

Power plants are costly to build and costly to operate. New ones take years to build. Demand-response can be implemented quickly and can reduce or altogether eliminate the need to build new peaking power plants and the associated transmission and distribution lines and equipment. Additionally, utilities sometimes charge larger customers more for peak-time power. With adequate demand-response participation, utilities can keep prices low and customer satisfaction high.

Environmental benefits

Demand-response smoothes out the energy demand curve, reducing the need to generate additional peak power. The resulting environmental benefit is substantial, because less fuel is burned and fewer greenhouse gases are generated.

1. *Efficiency and Innovation in U.S. Manufacturing Energy Use*, prepared by The National Association of Manufacturers and the Alliance to Save Energy, 2005

RESULTS

As the curtailment service provider, Net Peak records and reconciles all energy consumption data and generates weekly reports needed to validate load shed, so SUPERVALU's curtailment payments can be distributed.

For the Pennsylvania distribution centers alone, the return on investment resulting from the energy management initiatives will be twofold:

- First, payments and savings for the demand-response participation and curtailment will generate approximately \$75,000 to \$115,000 in annual revenue.
- Second, AEC's Opto 22-based monitoring and control systems have led to more efficient cooling and an overall reduction in the facilities' energy consumption during everyday operations. This has resulted in an estimated energy savings of over \$155,000 per year. The control system has also identified several refrigeration system inefficiencies that could push this figure even higher.

Additionally, by reducing its overall energy consumption, SUPERVALU is following through on its stated commitment to environmental sustainability (see sidebar).

Finally, SUPERVALU's distribution center energy monitoring and management project has enabled the company to take an active role in facilitating the creation of the smart grid. To date, this responsibility has largely fallen upon those on the supply side. Power providers and utilities have struggled to upgrade, modernize, and interconnect the networks and systems they use to generate and deliver power in order to share information and improve processes.

SUPERVALU is operating on the demand side and proving that end users, rather than waiting for their providers, can be proactive and pursue and implement smart grid technologies like intelligent meters, sensors, and real-time data aggregation and distribution devices. In doing so, these customers are experiencing the tremendous benefits of capturing their energy data in preparation for when the smart grid is fully realized.

ABOUT SUPERVALU

SUPERVALU INC. is one of the largest companies in the U.S. grocery channel with annual sales of approximately \$38 billion. SUPERVALU serves customers across the United

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States through a network of approximately 4,294 stores composed of 1,114 traditional retail stores, including 805 in-store pharmacies; 1,280 hard-discount stores, of which 899 are operated by licensee owners; and 1,900 independent stores serviced primarily by the company's traditional food distribution business. SUPERVALU has approximately 140,000 employees. For more information about SUPERVALU, visit www.supervalu.com.

ABOUT NET PEAK

NetPeak Energy Group LLC utilizes proprietary technology to deliver energy curtailment services to client companies in the grocery retail and non-food retail supply chains. The company provides curtailment services for major national chains. Its programs have generated rapid paybacks for sites ranging from 20 kilowatt auto parts stores to refrigerated warehouses having load curtailments over 1.5 megawatts. For additional information, go to www.netpeakenergy.com or call Michael Verkuylen at (920) 268-1686.

ABOUT ADVANCED ENERGY CONTROL

Advanced Energy Control (AEC) is a systems integrator that builds refrigeration control systems designed for strategic energy management. AEC control systems maintain maximum refrigeration while providing superior control over energy use. This level of control has repeatedly provided their customers with energy savings of 15-30% and the ability to increase their return on investment even further through maximized energy curtailment revenue. For more information, visit www.advancedenergycontrol.com.

ABOUT OPTO 22

Opto 22 was started in 1974 by a co-inventor of the solid-state relay (SSR), who discovered a way to make SSRs more reliable.

Opto 22 has consistently built products on open standards rather than on proprietary technologies. The company developed the red-white-yellow-black color-coding system for input/output (I/O) modules and the open Optomux® protocol, and pioneered Ethernet-based I/O.

In early 2013 Opto 22 introduced *groov* View, an easy-to-use IoT tool for developing and viewing mobile operator interfaces—mobile apps to securely monitor and control virtually any automation system or equipment.

Famous worldwide for its reliable industrial I/O, the company in 2018 introduced *groov* EPIC® (edge programmable industrial controller). EPIC has an open-source Linux® OS and provides connectivity to PLCs, software, and online services, plus data handling and visualization, in addition to real-time control.

All Opto 22 products are manufactured and supported in the U.S.A. Most solid-state SSRs and I/O modules are guaranteed for life.



The company is especially trusted for its continuing policy of providing free product support, free training, and free pre-sales engineering assistance.

For more information, visit opto22.com or contact **Opto 22 Pre-Sales Engineering:**

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