be retrofitted and at what cost. They came up with a rather unconventional approach for solving this part of the puzzle. Instead of performing a time-consuming measurement and analysis of each facility, they scored each property based its on square footage, total energy costs, energy cost per square foot, and energy usage per square foot. The worst 200 properties were given on-site audits. The remaining 2,100 properties received desktop audits based on facility and equipment data. To develop a list of projects that would meet the bank's three-year payback window, EMCOR employees contacted equipment manufacturers to determine the age and expected energy use of the equipment.

Armstrong indicates that although the measurement and verification methods proposed in the ECP were not traditional, the statistical model was effective, quick, and met Washington Mutual's needs. Furthermore, not doing the field measurement and verification generated additional savings.

Even with this fast-track approach to project scoping and contracting, precious time was ticking away for Washington Mutual. When all the major pieces were in place, less than four months remained. If EMCOR and its subcontractors were going to make the stipulated deadlines, de Grasse realized he was going to have to accelerate the usual accounts-payable process. To minimize financial delays, he proposed a zero-balance accounting system that balanced purchase orders with invoices. Under this innovative arrangement, EMCOR presented the bank with work projections for the coming month's expenses. Those projections were compared with the previous month's invoiced expenses. Any difference, positive or negative, was applied to the next month, so that neither party carried a debt from job to job. The bank paid EMCOR within one week of receiving the paperwork. EMCOR used a similar arrangement with its subcontractors.

It was November when the actual upgrades were initiated. With money, manpower, and materials readily available, EMCOR's 114 employees, subcontractors, and consultants worked at an unprecedented pace. For instance, at Washington Mutual's Silverton financial center outside of Portland, Oregon, EMCOR completed a comprehensive lighting retrofit, replaced a rooftop HVAC unit, and performed a number of low-cost/no-cost modifications such as adjusting thermostats and water heaters and installing water heater jackets and pipe covers. Most of the work EMCOR performed at the bank's sites fell into these categories, but some of the bank's bigger buildings underwent large mechanical retrofits, such as chiller and ice-storage plant replacements or pump and motor upgrades.

"Working with Washington Mutual was a breeze," says Becky Sims, energy-efficiency consultant with Portland General Electric. "Before we got started, I was a bit skeptical about working with an out-of-town contractor, but they were so well prepared that it was the fastest and easiest processing of a rebate incentive program that I've ever done."[5]

By December 31, 2001, Washington Mutual's ECP had achieved an annual reduction of more than 20 million kilowatt-hours (kWh), 49 million gallons of water, and $500,000 in utility bill administration costs—all of which resulted in an annualized reduction of nearly 11 percent. The final numbers for 2002 were still being analyzed at press time, but it appeared that Washington Mutual would reach a comparable reduction for 2002.

"I believe that the energy conservation program developed for Washington Mutual will far exceed the expectations and needs originally planned," says de Grasse. "At every step, we're finding new and better ways to tackle issues that will allow the ECP to become an integral part of the way the bank approaches its vendor relationships. This paradigm shift allows us to drive changes based on our own internal needs and expectations."

Harbec Plastics Cuts the Cord

A combination of high power prices and power quality issues drove Harbec Plastics Inc. of Ontario, New York, to seek energy independence. Harbec makes complex plastic parts, ranging from low-

"Energy is one of the key elements in our supply chain. We sought energy independence for economic savings, power reliability, and environmental control."

—Bob Bechtold Harbec Plastics

volume prototypes to large-quantity production items, for automobile, computer, and medical-device manufacturers that have intense time-to-market pressures. Its customers demand fast service, and Harbec is often able to deliver parts in 2 to 4 weeks that most firms in the industry would require 12 weeks to complete.

Harbec's computer-controlled systems are so sensitive that even momentary outages or voltage sags can cause significant problems. At best, a minimum of several hours is required to reprogram and restart after an unplanned shutdown. In worst-case scenarios, the company can lose days of production due to cutter-damaged mold surfaces. In June 1999, Harbec endured three separate power fluctuations that led to prolonged shutdowns, lost production, and missed deadlines.

"Energy is one of the key elements in our supply chain," says Bob Bechtold, president of Harbec Plastics. "Unreliable supply caused all sorts of problems for our business and for our customers."[6] Given that the company was also paying 10.5 cents per kWh—among the highest prices in the nation—Bechtold decided something different had to be done.

In late 2000, the company installed 25 gas-fired Capstone 330 MicroTurbines to meet its 500-kilowatt (kW) maximum load and to provide 250 kW in redundant generation (**Figure 1**).[7] The company also installed a heat-recovery boiler to run a radiant heating system built into the slab of a 17,000-square-foot warehouse expansion. In summer, the hot water from the boiler is used to fire an absorption chiller, which provides air conditioning for the manufacturing and warehouse areas. Total system efficiency exceeds 70 percent. Since July 2001, the microturbines have generated 100 percent of Harbec's energy needs. The facility's connection to the grid is maintained only for backup.

"We sought energy independence for economic savings, power reliability, and environmental control. Based on our present gas contract, we're currently producing power at between 8 and 9 cents per kWh, but when the thermal value is added in, the cost drops to between 5 and 6 cents per kWh. Our new system also allows us to constantly control our manufacturing-facility environment year round," Bechtold says.

Figure 1: Harbec Plastics stands alone

Bob Bechtold, president of Harbec Plastics, stands beside one of the 25 gas-fired Capstone 330 MicroTurbines installed on-site to meet the plant's base-load electricity requirements. Recaptured heat from the turbines provides hot water for a radiant floor heating system and for an absorption chiller.

Courtesy: Capstone Turbine Corp. [7]

Even though it enjoys a large degree of energy independence, Harbec's relationship with its local utility continues to be vexing at times. "Right now it costs $1,100 per month to maintain a backup connection to the grid, but we expect that price to double or triple when a new Public Service Commission–approved standby tariff takes effect. Plus, it will drive our price for backup power up to as high as 25 cents per kWh," explains Bechtold.

That prospect is so untenable that Harbec is now considering investing in a 600-kW biodiesel generator for additional backup capability. If that unit is installed, the company may reluctantly cut its grid connection. That would not be Harbec's preference, but Bechtold feels that the firm's energy provider is giving him little choice.

Looking for even greater independence, Harbec recently erected a 250-kW wind generator on-site to reduce the amount of natural gas it uses to generate power. This company's decisions demonstrate how far some customers are willing to go to control their energy costs and reliability risks.