

POWER MONITORING KEEPS SKI RESORT ONLINE YEAR-ROUND

Most probably wouldn't consider a ski resort a particularly big consumer of energy. But depending on the weather of a given season – particularly related to snowfall – it can become just that very quickly.

Bear Creek Mountain Resort & Conference Center is located on more than 330 acres in scenic Berks County, Penn. In the winter, the resort features skiing, snowboarding and snow tubing, along with other winter activities. In the summer, it's ideal for hiking, biking, fishing and boating. For skiing – the backbone of the business – the resort features 21 trails and seven ski lifts.

In 1999, the resort ownership changed hands, and went about the business of upgrading and expanding the resort into more of a year-round destination. In fact, since the acquisition, the current ownership group has put almost \$100 million into the resort – making improvements across the board.

That year was also when Dustin Yeager, mountain electrician for Bear Creek, took charge of the electrical department for the resort. Almost immediately upon being hired, Yeager began working on plans to update the site's electrical system – as part of the new ownership group's expansion plans.

Major Upgrades Bring New Challenges

With the resort's growth and expansion, came increasing power demands. For starters, a large 65-room hotel was added to the property. But the expansion of the ski hills was what Yeager and his team most concentrated on. In addition to ski lifts and the other electrical devices needed to keep the hills operating, there are high-powered snow guns needed to manufacture enough fresh powder to enable skiing when the weather isn't cooperating.

"We have a 5 megavolt amperes (MVA) cap on our incoming power from the utility, and anything more than that will cook the fuses on the utilities' power lines down the road," says Yeager. "As we continued to grow, we had massive new power requirements – mostly related to our snow-making equipment – that we couldn't keep under our 5MVA cap."

In the past, the resort only had the capacity to make snow on one trail at a time. Now, Bear Creek has 125 snow guns that can be positioned around the property – enough to simultaneously make snow on most of the resort's hills. Supplying enough water to all the new snow guns required Bear Creek to also build a new pump house in 2007.

"When we are running heavy snow-making loads, we are running almost 7.2 MVA, so essentially we needed a load-shedding sequence to keep us under our 5 MVA cap," says Yeager. "We have six diesel generators on site, varying in size from 125 kilowatts (KW) to 1600 KW. The largest (the 1600 KW) runs the pump house."



This past season was especially trying with almost no snowfall to speak of, requiring snow to be made constantly. “In all reality, we rely on snowmaking almost 100 percent; it’s what gets people here and makes us money. If we wouldn’t have had snowmaking capabilities this year, we would not have opened once for skiing.”

Power Monitoring Keeps Tabs

To control its load-shedding program, Bear Creek turned to Schneider Electric and its Square D® engineering services for a customized power monitoring solution. The backbone, Square D® PowerLogic® System Manager™ software, runs from an application server that provides the visualization of the electrical system. Connected to the PowerLogic software are two Square D® PowerLogic® CM4000 and six CM4250 circuit monitors at eight different transformer and distribution centers on the property.

“We had old meters in place on the property, and a basic system that worked alright,” says Yeager. “But over the years we needed something a little more sophisticated, especially to help us shed loads when needed.” The system is now set to start shedding loads with the generators when the load gets to 4.2 MVA.

“On a good day with three generators running, I can drop over 2 MW from the utility,” says Yeager. “We can then transfer that power up to the hills – where there aren’t any generators – for snowmaking, which is by far our largest power consumer.”

In addition to the meters, Square D engineering services designed the controls that integrate with the PowerLogic system at Bear Creek. Since the PowerLogic system uses open Modbus® TCP Ethernet communications, Square D Momentum I/O programmable logic controllers (PLCs) with Ethernet cards were installed. A PLC was placed at each of the six generators on the property to activate the load shedding sequence. The PLCs are connected to automatic transfer switches (ATSs) and make the determination when to engage the switches and start the generators.

“The PLCs are also there to give us a much wider range of options down the road, or even at that point in time considering what you want to do and how discrete or indiscrete you want to be with your information,” says Yeager.

The ATSs are ranked in priority one through four. Priority 1 is the first load to be shed, Priority 2 the second and so on. If predicted demand power reaches 4.2 MW, an alarm is issued and a command is sent to automatically transfer Priority 1 ATS to emergency source. There is then an on-demand interval delay to recalculate demand. If after the delay the predicted demand is still at 4.2 MW or higher, an alarm is issued and the Priority 2 ATS is commanded to transfer to emergency source. This goes on with Priority 3 and 4 ATSs.

“When we are making snow, the power monitoring system has proved invaluable,” says Yeager. “It keeps us from going over our cap with the utility. Sometimes, in the course of making snow, our guys forget to turn



on a generator to make up for the power they're using when they turn on the pumps. Without the system, we'd go over our limit. But the monitoring software has a virtual meter in it that says when we hit 4.2 MVA, it will automatically kick on another generator to shed some of the increased load."

Custom Graphics and Ethernet Connectivity Add to Robust System

As a customized feature to the power monitoring system for Bear Creek, the Square D engineering services application engineer worked with the resort to create custom graphic displays to monitor all areas of the resort. The displays were created using background images of maps of the resort grounds and included Bear Creek logos. The result is easy-to-navigate screens that are familiar to Yeager and his staff.

The layout of the system breaks into four main pages; one for generator controls, one for monitoring, one page is a site map and the last page is a historical data page that Yeager uses to pull up reports or look through recent system events. "The graphical layout makes it very easy to locate issues and monitor items," says Yeager. "The set-up is very user-friendly – everything is right at our fingertips."

A large part of the electrical upgrades that Yeager and his team planned for was installing a large-scale fiber-optic network across the entire property. "We've put in over one-and-a-half miles of fiber-optic cable in the ground last year," says Yeager. "It was put in to help automate the snow guns and also communicate with the weather stations and things of that nature to adjust them on a constant basis. Previously, we had wireless, but it just didn't prove to be reliable enough."

But the Ethernet network was also useful in employing the new power monitoring system. "I can say that without the fiber-optic project we did, we definitely would not be in the same position we are in now with the whole power monitoring system," adds Yeager.

With the Ethernet network, Yeager is able to access the power monitoring system from anywhere on the property. "I usually just have my laptop with me, or I can log onto any computer on the property to check in and monitor things," says Yeager. "I can see the predicted kW demand for the entire site, or see alarms, and know the status if the ATS is currently on generator power or not. I can even see if the 24VDC battery supply is fully charged or disconnected."

In addition, Bear Creek is now able to see the electrical one-line distribution overlaid on the ski runs. This makes it easy to compare real time current, real power, bus voltage and the status of the whole system, and it's essential for Yeager and his team to be able to see the status pertaining to the PLC load shed scheme and ATSs.

Integration of the new power monitoring system also proved easy. "It went really smooth, especially with the Ethernet backbone we had in place," adds Yeager. "There weren't any communication problems when things came online – everything was right there."

Beyond the snowmaking, Yeager is able to detect issues on other parts of the property as well. "Sometimes when we run the snow machines, we



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get calls from some of the facilities staff about a chiller tripping out, or maybe an elevator is having power issues. I can use the system to isolate any part of the property I want, and essentially prove that the power is reliable and of good quality, and that what we're doing is having no effect on their equipment."

The resort also has a history of weather-related power incidents – most notably frequent lightning strikes – and now can use the power monitoring system to easily detect such an occurrence and bring things back online.

Reporting Proves Invaluable

Yeager also relies heavily on the reporting function on the system. "Snow-making is actually considered manufacturing, so all the electricity we use can be put towards tax rebates," he says. "With the system taking the KWH readings off the meters, I can easily produce reports that clearly document our power usage in that area, so it can be verified and approved by an engineer and we can secure our tax rebates."

Furthermore, Bear Creek is in the process of getting its electricity cap upgraded with the utility to something in the 9 or 10 MVA range. "With the system, I take the reports the power monitoring system generates, showing our weekly and monthly consumption totals, and provide them to the power company as evidence that we could use a little bump in our cap with them."

The increased reliability of Bear Creek's electrical system has also provided substantial cost-savings. "From a downtime standpoint, the system probably saves hundreds of thousands of dollars for the resort," adds Yeager. "This was key when we proposed the project to management. We went in-depth and showed them what could happen if we exceed our cap, then blow our fuses, freeze up snow guns, etc. The cost to replace the equipment is high, but more so, the loss of business on a normal day over the Christmas Holiday can exceed \$200,000. Lost revenues from just a couple days would be enormous."

Also, Yeager is using it to become more conscious of the resort's electrical consumption and KW usage. "There's going to come a point where I may have to produce a report that shows management that we are spending more money on snow-making than we are ever going to recover compared to the rest of the seasons. Snow-making drives our electrical bills to an average of \$100,000 a month."

Down the road, Bear Creek plans on utilizing even more of the capabilities the power monitoring system provides – especially with deregulation on the horizon. "It is going to be a huge help to us especially with rising utility costs and everything else, so much so that I think down the road the system will actually be more valuable to us than it is now."

