

MICRO GRID SYSTEM GIVES MOTHER NATURE A HELPING HAND



One of the snowmaking “guns” powered by the micro-grid.

The Snow Summit ski resort crowns the San Bernardino Mountains, about two hours east of Los Angeles. Despite peaks that rise above 8,000 feet, average annual snowfall is a “mere” 100 inches in this semi-arid Southern California location. To maintain a solid snow base of between three and five feet throughout the ski season, Snow Summit recently installed a \$6 million upgrade to its snowmaking system that increased snowmaking capacity by 50 percent. This system requires about 12 megawatts of electricity to power air compressors, water pumps and fan guns. That’s more than the electric utility can provide, so Snow Summit relies on a prime power “micro-grid” from Cummins Power Generation Inc. to make snow.

The micro-grid is a medium-voltage distribution loop with various load taps

along three miles of underground power lines. It consists of an integrated system of generators, transfer switches, digital paralleling equipment and controls, all manufactured by Cummins Power Generation Inc. This system gives the flexibility not only to power snowmaking equipment, but also to provide resort-wide power in the event of utility failure and to allow equipment to be taken offline for maintenance.

The system includes six Cummins Power Generation 2 MW prime power diesel generators (model DQLA) powered by 78-liter Cummins engines. That capacity, plus 2.5MW available from the local utility, powers the resort. Due to the relatively high operating hours, the generator sets are equipped with emissions-control equipment that employs a combination of continuously regenerat-

ing particulate traps and a selective catalytic reduction (SCR) system. These emissions-control systems meet Southern California’s stringent air-quality standards.

MAKE IT SNOW!

Established in 1953, Snow Summit has used snowmaking equipment since the earliest years. By 1964, its single chairlift was the first in the West to be served by snowmaking equipment. Since 1979, Snow Summit has had its own power system to run its snowmaking equipment.

These days, the resort’s goal is to be up and running by Thanksgiving, and by Christmas to have all of the 14 lifts open and up to 90 percent of the runs open –

Continued on Page 32



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Microgrid generation

Continued from Page 30

about 18 skiable miles over 250 acres. Since the resort cannot depend on nature for snow, snowmaking equipment typically operates about 1,000 hours each year.

Man-made snow is real snow (not “artificial”), made by “guns” spraying atomized water particles under high pressure into the cold dry atmosphere, which freeze into snow particles before they hit the ground. Half of the snow is produced by about 75 fan guns; the other half is made by compressed air-powered guns. With all guns “smoking”, maximum water consumption is 8,000 gallons per minute. Several hundred million gallons of water supplied by Big Bear Lake at the base of the mountain are converted into snow each season.

“In ideal conditions, we reach flow rates of 5,000 to 6,000 gallons per minute for several days and nights, non-stop,” says Bob Sokolowski, Snow Summit’s utilities and planning manager.

Of course, this requires plenty of electric power – and the power needs to be available at a moment’s notice. “You have to make snow when the weather allows it. If you miss the opportunity, you lose it,” says Sokolowski.

When Snow Summit’s equipment is not making snow, the local utility provides enough power to run the chairlifts and the base area’s lodge, bars, restaurants and shops. But when it’s time to make snow, the micro-grid goes into operation.

TOTAL FLEXIBILITY

“One of our toughest challenges was making the generators run in whatever configuration we need at any given time,” says Sokolowski. Often, electricity is flowing from three sources: the utility; three generator sets at the top of the mountain; and three generator sets in the base area. If the utility should fail, Snow Summit needs to power the entire resort on the micro-grid. Furthermore, though it hasn’t yet been needed, the resort can supply the utility with power if a forest fire or other catastrophe should ever cut off the utility’s high-voltage transmission lines.

Working with Cummins Cal Pacific, Irvine, Calif., Sokolowski was able to design a system that balances flexibility, safety, cost-control and efficiency. Almost any load can be assigned to any genset. The three generator sets on the mountaintop are there so that if the base-to-mountaintop transmission lines should fail, the resort’s five top-driven chairlifts can be quickly connected to the mountaintop generators – and skiing will continue merrily along. Those three mountaintop generators also power five pumps totaling 725 horsepower that bring snowmaking water from mountaintop holding ponds. This does not eliminate the need to pump water up the mountain from Big Bear Lake, which is near the base area, but a bi-directional water system helps increase snowmaking efficiency.



The “micro-grid” system includes six Cummins Power Generation 2 MW prime power diesel generators (model DQLA) powered by 78-liter Cummins engines.

TOTAL CONTROL

Integral to the flexibility of Snow Summit’s complex micro-grid are two PowerCommand digital master controllers (DMC) that communicate with each other over a mile of fiber optic cable. One of the DMC’s most important jobs is to match the voltage and frequency between the six generator sets and the utility within seconds whenever the combination of power sources must change. To do this, the DMC automatically tracks electric demand in real-time and manages input from an array of generator set sensors, paralleling switchgear and 12 automatic transfer switches.

A smooth transition among generating sources is essential to avoid service interruption and equipment damage.

“This system does exactly what I asked for,” Sokolowski says. As Sokolowski and his crews manage the PowerCommand DMC, Snow Summit visitors never need to think about the complex infrastructure all around them. They simply enjoy their vacation time on the deep-base slopes.



The snowmaking system at Snow Summit Ski Resort requires about 12 megawatts of electricity to power air compressors, water pumps and fan guns.