A night-time photograph of a ski resort. The scene is illuminated by artificial lights, creating a blue and white glow. Ski lifts are visible on the slopes, and buildings with warm lights are in the background. The overall atmosphere is serene and modern.

NIGHT SKIING *IN A* NEW LIGHT

Not all U.S. resorts offer night skiing programs, but that may start to change given new technology designed to offer more precision, astonishing energy efficiency, and less harsh glare than conventional bulbs—all of which could put night skiing in its best possible light.

BY DAVE BYRD, DIRECTOR OF RISK & REGULATORY AFFAIRS



Steamboat won over the city's zoning board with a compelling presentation that included this computer model representation of how the new lighting technology would appear on the slopes.

When Colorado's Steamboat Ski Resort considered the idea of adopting a night skiing program last season, management knew it was going to have to somehow placate the surrounding homeowners whose properties lined the ski trails. Those property owners would surely raise concerns with the Steamboat city council and zoning board about light pollution and its perceived effects on land values. Traditional lighting options for night skiing, including metal halide and high-pressured sodium lights, were likely to anger some people.

But Steamboat saw the light—literally. Doug Allen, vice president of mountain operations, chanced upon a remarkable new lighting technology called Snow-Bright™ from Ultra Tech Lighting. The technology, which employs magnetic induction lights specially tailored for night skiing, can focus the lights directly onto the ski trails with better precision, lighting only the trails and effectively eliminating the vast majority of light pollution, or spillage, that is typically related to night skiing operations. For a planned installation of more than 350 lights—a \$1 million investment—there was a lot riding on Steamboat's efforts to reconcile the concerns of their neighbors.

While night skiing, night tubing, and night racing are well entrenched at ski areas closer to urban markets in the East and the Midwest, larger destination resorts, especially in the West, have been cool to the concept. But Steamboat's adoption of night skiing and this new, improved technology may open the door to broader industry adoption of snowsports at night.

Ultra Tech, a small, New Jersey-based lighting start-up, was founded by Phil Gotthelf, a commodity trader by day and a huge skiing enthusiast off the clock. (Gotthelf is a PSIA-certified adaptive ski instructor at Windham Mountain in New York, and both his daughters are freestyle instructors there.) Working with an Israeli engineer

named Nathan Guedalia, Ultra Tech adapted existing magnetic induction lighting by developing proprietary technology that specially engineers the spectral output from induction bulbs to make the light far more effective for illuminating the unique characteristics of a snow surface.

With conventional lights for night skiing, the existing philosophy is that more intense directional lighting will lead to better visibility on the snow. However, this can create noticeable light pollution that spills over into the sky and the surrounding areas. Larger lighting manufacturers, like Sylvania and Phillips, ignored the smaller ski area market, believing it too small and esoteric to invest research and resources. But for a lifelong skier like Gotthelf, he knew there was room for improvement.

To be sure, conventional lighting technologies involving metal halide and high-pressure sodium lights remain the industry standard, and certainly provide an amazing level of illumination for a safe and enjoyable night skiing experience. Years ago, NSAA worked with the Illuminating Engineering Society of North America (IESNA) to develop guidelines for Sports and Recreational

Area Lighting, which provides recommendations for luminance, design, spacing, and height and directional considerations. These factors differ based on a resort's site-specific characteristics such as weather, trail width, gradient, and so on. Indeed, the luminance guidelines in section 6.24 of the IESNA code will not be impacted by whether a resort uses conventional bulbs or the new Snow-Bright lights, and will remain the industry benchmark for night skiing.

The difference with Gotthelf's new lighting technology is that the Snow-Bright lights penetrate into the crystals of the snow and refract the light, akin to how a diamond refracts light. As a result, the light travels through the snow instead of reflecting off the snow like a mirror, which occurs with metal halide or high-pressure sodium lights. This refraction of light significantly minimizes the harsh glare on snow, which prevents the "glow" from night lighting at ski areas and the potential for light pollution.

The result is a more uniform and effective lighting of the actual snow surface to be illuminated—without the angry neighbors.

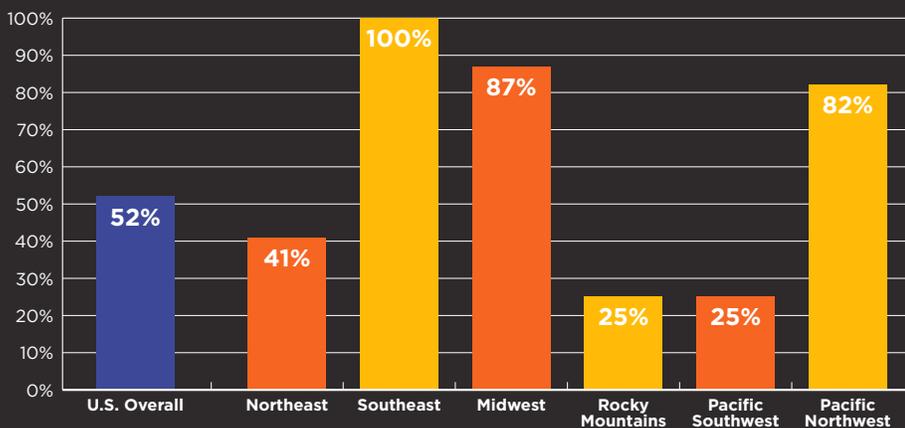
While reducing light pollution was critical to Steamboat, the opportunity to improve on-mountain safety was paramount. The white surface of snow is highly reflective, presenting significant challenges for a skier/rider's visual perception. The metal halide and high-pressure sodium lights that most resorts use for night skiing produce a very bright glare on the snow and concentrate light in a narrow visible spectrum. This makes colors muted and indistinguishable, adding to the challenge for the human eye to resolve contours on the mountain.

"Our goal was not just to have night skiing, but *really good* night skiing," Steamboat's Doug Allen said. "These Snow-Bright lights give off a broader spectrum of color that the other lights don't, and they better enable the eye to pick up all aspects of skiing... the contours, the terrain, the bumps. It's so vivid. Brighter lights don't necessarily equate to better visibility, it's more about the color of the light."

For advice and insight, Steamboat turned to the first ski area to embrace this new lighting technology, Mount Peter Ski Area in Warwick, New York, which has experimented with all three main types of night lighting technologies, including Ultra Tech's Snow-Bright lights.

Mount Peter served as the ski industry's guinea pig for induction lighting last season. Located near the New York and New Jersey state lines, the area has a thriving night skiing program. With 150 lights all over its hill, Mount Peter employs a gamut of lighting technologies, including halogens, metal halide, and low- and high-pressure sodium lights. Starting

Percentage of Resorts with Night Skiing — by Region, 2012/13



Source: Kottke Survey — maximum available resort sample each season.



A side-by-side comparison of conventional (left) and magnetic induction (right) lighting on snow at Mount Peter, New York. Conventional bulbs tend to create an orange-ish cast whereas new lighting technology helps retain the true color and characteristics of the snow surface.

in 2012, the area initially installed 12 lights from Ultra Tech on its Dynamite Racer trail, where USSA race training takes place, especially at night.

Mount Peter (where Babe Ruth often skied) was more than impressed with Snow-Bright lights compared with its existing traditional lights. “It really does something to the [visibility of the] snow. The depth perception is amazing,” said Karl Kullberg, mountain manager. “I wanted new lighting that would give some definition to the snow, and it sure did that.”

Kullberg said he was initially “very skeptical” of the remarkable claims made by Ultra Tech’s Phil Gotthelf but was quickly won over. “You have to see it to believe it,” he stressed. “The detail of the terrain is noticeably different. It somehow magically defines the crystals and brings out the snow.”

Aesthetics aside, for Kullberg, the overall improvement in on-mountain safety was the most compelling part of this new technology. A lifelong ski racer, he immediately realized that there would be a significant improvement to the resort’s night skiing and race club training programs. With nearly 300 ski racers, Mount Peter has one of the fastest growing ski clubs in the country.

Given the time constraints with families’ schedules—especially on busy weekends with competing demands—expanding training opportunities

into the evening hours provides a lot more flexibility for race club training, explained Rob Dowd, Mount Peter’s racing program director. “This new lighting definitely makes a dramatic difference [in visibility]. It’s amazing—the lights are hyper-focused on the run... there’s almost zero light wash,” said Dowd, who was named 2013 USSA Coach of the Year. The improved safety is now a selling point to parents to encourage them to get their children into racing, too. “I want 20 more of these lights,” he added. And according to his boss, he’s going to get them.

Kullberg noted that even for those resorts that do not embrace night skiing, the new lighting technology provides added safety benefits. “For big resorts, this technology will give much better visible acuity in the base areas and for their lodges,” he said. Furthermore, Kullberg pointed out that many ski areas will consider new lighting for parking lots, given its enhanced illumination on wet or snowy surfaces.

There is a fascinating back story to the history of magnetic induction lighting. This technology was invented by Nikola Tesla, the Serbian-born, wildly inventive engineer who both worked with, and competed against, Thomas Edison on a number

of applications for electricity. Tesla tried to persuade Edison that induction lighting was better than Edison’s incandescent bulbs, largely because induction lights last for tens of years without needing to change out bulbs. But Edison flat out rejected Tesla’s induction lighting. Where was the planned obsolescence?, Edison asked. If induction lights hardly ever burn out and do not need to be replaced, how would their company ever make any money?

This is a significant selling point for Ultra Tech (and Reliable Racing, which is the distributor for Ultra Tech). The Snow-Bright lights have a life span of more than 100,000 hours. Meanwhile, conventional lights used for night skiing last a fraction of that, between 2,000 and 6,000 hours. Consider this: If a resort offered four hours of this lighting every evening for roughly four to six months, Snow-Bright lamps would last for more than half a century, according to Gotthelf.

Ultra Tech estimates that resorts will save 600 percent in maintenance costs alone since they won’t have to change out bulbs. “I’m replacing 1,500-watt halogens with two 300-watt induction lights from Ultra Tech,” said Mount Peter’s Kullberg. “I’m going to be long gone by the time they need to change out these new bulbs.”

Indeed, Mount Peter’s local utility company, which provides incentives

to consumers to reduce energy, is covering 25 percent of the costs of the new lights because they are so much more efficient than traditional lighting options. Thanks to huge savings in energy costs compared to traditional lighting options, Mount Peter is looking to replace all of its conventional night lights with Snow-Bright lights. “My goal is to have 100 percent of the mountain using these lights, not just the race trails,” Kullberg said.

In addition to lasting decades longer than traditional lighting, Ultra Tech lights use far less energy than conventional lights because their lamps use lower wattage. Metal halide lights typically use 1,000 watts, whereas Ultra Tech lights operate at 300 watts. With a strategic lighting plan, Gotthelf said, resorts can reduce their electricity costs for night lighting by 60 to 80 percent.

Moreover, there are rebates available for resorts with existing night lighting looking to retrofit and replace their conventional lights with new, energy-saving lights like Snow-Bright fixtures. And for Excel Energy customers in Colorado, New Mexico, and Minnesota, ski areas that replace their existing 1,000-watt metal halide or high-pressure sodium lights with 300-watt Snow-Bright fixtures will be eligible for rebates around \$300 per lamp, according to Excel’s John Schneider. For retrofits, this makes the Snow-Bright cost lower than metal halide or high-pressure sodium.

LEDs (light emitting diodes) are highly efficient, but they are less practical for lighting snow surfaces, according to Gotthelf. Because LEDs tend to have deficiencies in spectral output compared to magnetic induction lights, LED lights for ski areas have to compensate with overly intense output. LED lights, like Snow-Bright induction lights, use far less energy than metal halide and similar conventional lights, but LEDs

are much more expensive, often costing three times as much as conventional lighting options.

There are other, less tangible benefits to this new lighting technology. Unlike conventional lights, Snow-Bright lights do not make any whirring noise. In addition, the lights are less damaging and disturbing to nocturnal wildlife, given the lights’ overall lower intensity. The impact of these lights on habitats for fox, deer, owls, bears, elk, and moose is far less pronounced than with conventional lights, which tend to blind or stun wildlife—an upside that will likely be reassuring to the U.S. Forest Service.

Indeed, Snowy Range Ski Area—which is located on the Medicine Bow-Routt National Forests near Laramie, Wyoming—became the first ski area to receive approval from the U.S. Forest Service for an installation of this new lighting technology. Snowy Range, which will operate night skiing and night tubing under these lights, received approval in September 2013 from the Forest Service, after a public comment period over the summer. The Forest Service concluded that the lighting would not adversely affect the Canadian lynx habitat in and around the ski area, and approved the ski area’s lighting proposal.

Interestingly, Snowy Range was something of a mini-test case for limiting light pollution. As the crow flies, Snowy Range is about 18 miles from the University of Wyoming’s observatory and telescope located atop nearby Mt. Jelm, which is one of the premier infrared observatories in the world. While Snowy Range’s installation is comparatively small, the observatory found that after research-

ing the technology and the proposed installation, it was comfortable that Snowy Range’s night lighting would not impact the need for surrounding pitch-black skies.

Aaron Maddox, the general manager of Snowy Range, was surprised how effective the technology proved to be at limiting light spillage when he began installing the lights last November. “When we installed the first light, it was snowing pretty heavy at the time,” Maddox noted. “But the light did not reflect off the snow coming down...it didn’t project at all above the fixture into the night sky. Actually, it’s pretty amazing.”

Beyond minimizing light pollution, there are additional upsides to this technology. Magnetic induction lights such as Snow-Bright lights can be turned off and on immediately, without any re-illumination time. Conventional lights for night skiing take 20 to 30 minutes before they can be re-illuminated. Remember the now-infamous power outage during the 2013 NFL Super Bowl at the Superdome? It took the Superdome 34 minutes to re-illuminate the high-intensity field lights before play could resume. The Superdome uses the same conventional lights used by most night skiing operators.

Lastly, induction lights like Snow-Bright do not have dispersed mercury the way conventional incandescent bulbs do, which makes disposal, clean-up, and recycling difficult and expensive. The Snow-Bright lights contain two solid mercury slugs, not dispersed mercury, which can be easily removed and mailed back to Ultra Tech for recycling. Did you know that if you break a traditional bulb, given the significant hazards of ambient mercury, OSHA mandates costly and extensive cleanup protocols for conventional bulbs (for example, using duct tape,

instead of sweeping, to remediate a broken light)?

To be sure, there is a downside. Upfront costs of these lighting fixtures initially may be more expensive than metal halide or high-pressure sodium lights, depending on wattage and sizes, with a premium of about 30 percent higher costs over traditional lights. Whereas metal halide light fixtures typically range between \$400 and \$1,000 depending on quality, the Snow-Bright 300-watt fixtures sell for roughly \$700. But with energy savings, maintenance savings, and overall improved safety, the return on investment is satisfied within just a few years, Gotthelf said.

Doug Allen's research paid off for Steamboat. Despite the concerns raised by the neighboring property owners over

the perceived light pollution from the ski area, Ultra Tech created a photometric study and computer model representation for the city's zoning board showing how the lighting would look on the mountain and the surrounding areas. The presentation was so persuasive the Steamboat Springs City Council and City Planning Commission unanimously approved the resort's night skiing proposal.

Overall, just over half of all ski areas in the United States offer night skiing, but it is highly concentrated near urban markets, with resorts in the Southeast, Midwest, and Pacific Northwest making up the lion's share. While many resorts offer night skiing, on average it represents between 7 and 8 percent of all skier visits, according to the *2013 NSAA Kottke National End of Season Survey*. Yet in the Midwest and the Southeast, night skiing accounts for nearly one quarter of all skier visits in those regions.

For Steamboat—which prides itself on offering a wide array of family friendly options—night skiing made perfect sense. “Families will be able to enjoy the slopes together at night, have non-skiing members watch from the condo, hotel, or base area restaurant, and know it’s a safe environment,” Allen reasoned. “This certainly reinforces the family environment of our ski resort.”

This season Steamboat is offering night skiing on weekend nights from 5:30 to 8:30 p.m., with expanded hours on holidays and special occasions. The lighting installation will allow for night skiing from Christie Peak down to the base area, covering roughly 1,100 vertical feet of terrain, including the Lil’ Rodeo Terrain Park. And Steamboat will have added lift ticket options, with both separate and expanded passes for night skiing (not to mention the opportunity for more hamburger and beer sales).

“Even if a family gets to the resort in the late afternoon, there’s still an option to let the kids ski that evening,” Allen explained. “This expands the array of pass sales we can do here at Steamboat, and gives families more options for their stay.”

With such advances in lighting technology like Snow-Bright, will more resorts follow Steamboat’s lead and embrace opportunities for night skiing, night racing, or night tubing? Given the fleeting length of winter daylight, expanding sales options into the evening hours—with improvements in technology to make night skiing safer and less expensive to operate—more destination resorts may be more willing to give night skiing further consideration.

In short, this new technology will allow resorts to look at night skiing, well, in a new light. ■

Steamboat Offers First-Ever ‘Night Tracks’ at NSAA Winter Conference

You may have heard about the famed “First Tracks” event held at NSAA’s Winter Conferences...the breakfast burritos, the bacon, sausage, and bagels, not to mention the fresh powder and old friends. Now, welcome to the first ever “Night Tracks” (sans the grease and carbs).

To celebrate Steamboat’s new and innovative night skiing initiative, NSAA will host the program on Wednesday, January 22, the second night of the conference, for an evening of skiing and riding under the newly installed Ultra Tech lights. This is a perfect opportunity to check out how this dramatic new technology will put night skiing in an entirely new light.

Join Steamboat’s Doug Allen and Roger Perricone—along with Ultra Tech’s founder Phil Gotthelf and Reliable Racing’s John Jacobs, who are sponsoring the event—as they lead our crew on a tour of the resort’s lighting installation, with an in-person explanation of how this new technology works and how it may revolutionize night operations. For mountain operations folks and resort race club managers, you have to see it to believe it—and you won’t even have to squint!