ASPEN SNOWMASS.

Turning Polluting Methane into Clean Energy

A PROGRESS REPORT FROM ASPEN SKIING COMPANY

WINTER 2021

Methane emissions are a huge problem when it comes to global warming. When released directly into the air, methane absorbs the sun's heat and has a warming potential 86 times that of carbon-dioxide. Nearly half of these emissions are from man-made sources, primarily fossil fuels and agriculture. The good news is that viable solutions exist to reduce methane emissions now and begin to slow the rate of warming.

Indeed, scientists have shown that addressing global emissions of methane and soot could shave nearly one degree Fahrenheit off of the warming projected by mid-century. As leading climate scientist Drew Shindell from Duke University says: "Ultimately, we have to deal with carbon-dioxide, but in the short term, dealing with these pollutants is more doable, and it brings fast benefits."

Policy solutions are imperative, and the Biden administration is working on new regulations. But individual companies also have the power to make a difference.

This report tells the story of how Aspen Skiing Company and its partners – Oxbow's Elk Creek Mine, Holy Cross Energy, and Vessels Carbon Solutions – converted waste methane from a coal plant in Somerset, Colorado into usable electricity, reducing greenhouse gas emissions and generating financial return along the way.

Strange Bedfellows: How It All Began

The story of how Aspen Skiing Company helped turn an old coal mine into a clean-energy production facility began with Colorado energy entrepreneur Tom Vessels and environmentalist Randy Udall. They wanted to generate power by burning methane that was leaking from coal mines all over the West.

The opening of the methane plant in 2012

The two approached Holy Cross Energy, a local utility company, that had a goal of transitioning to 20 percent renewable energy by 2015. (The company has since announced a goal of 100 percent renewable energy by 2030, but that's another story.) Holy Cross agreed. But finding a mine operator willing to take on this risky venture with limited profit potential took years.

The first to commit was conservative billionaire Bill Koch (of Koch brothers fame), owner of Oxbow Carbon, which runs the Elk Creek Mine in Somerset, Colorado. For him, the value of the project "had nothing to do with its positive impact on global warming," he told the *Aspen Times* in 2013, but rather the good business prospect of turning methane into electricity that could be sold to the local utility. With Holy Cross and Koch on board, all of the pieces were in place, minus the capital to make it happen. Enter Aspen Skiing Company (ASC).

ASC had long recognized climate change as an existential threat to its business. Warming temperatures meant Aspen had a month fewer days of winter than it did in 1940, and earlier snowmelt and warmer seasons was already threatening March skiing, one of the industry's most profitable months.

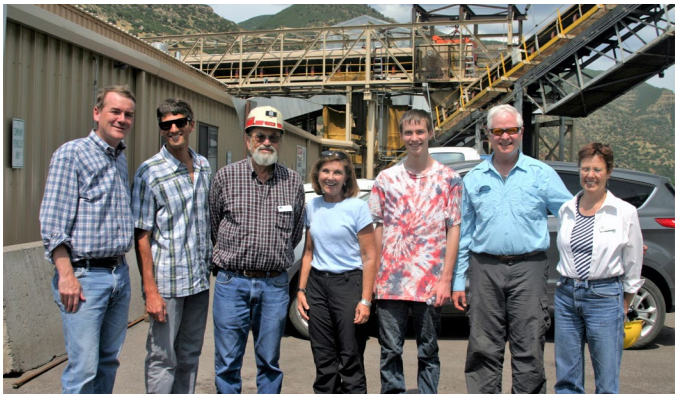
To reduce its carbon footprint, the company had started to become a renewable energy producer. ASC was the first in the ski industry to build a solar array in 2004, followed by a micro-hydroelectric plant tied to their snowmaking system. The company then installed a 147-kilowatt solar array on the Colorado Rocky Mountain School campus in Carbondale in 2008. At the time, it was the largest solar array on Colorado's Western Slope. However, none of these projects generated enough power in relation to ASC's high-energy needs.

The proposed methane-to-electricity project was attractive because it would produce far more energy than the others. It would also eliminate the potent methane released into the atmosphere from the coal mine – a key contributor to global warming. In this way, the project would model a global climate solution.

One of the methane plant generators

In 2012, ASC decided to invest $5.34 million (out of the $6 million needed) to build the 3-megawatt plant, the first of its kind in the United States, and the unique partnership was born. The project started generating power later that year, and continues to do so today. It initially ran alongside coal mine operations, but was designed to continue power generation after the mine closed in 2014.

What the Project Has Accomplished: Energy Production, Reducing Greenhouse Gas Emissions, Financial Return



Colorado Senator Michael Bennet (left) tours the plant with Aspen Skiing Company CEO Mike Kaplan (second from left) in 2013

Energy Production

By converting waste methane into energy, the Elk Creek Mine produces 3 megawatts of baseload power, which delivers 24 million kilowatt hours annually, approximately as much energy as ASC uses annually at all four of its resorts, including hotels and restaurants.

To make this much power from solar energy (which can't run 24/7/365 like the methane plant), you'd need 12 megawatts of panels – covering as much as 100 football fields. Another way to say it: In an average year, the plant produces enough energy to power about 1,800 U.S. homes.

The electricity generated and the carbon offsets flow into the utility grid, not to ASC directly. Therefore, the resort does not claim that it is 100 percent carbon neutral. Instead, the project did something more important: it helped green the entire regional grid, knocking almost 10 percent off the utility's carbon footprint.

Reducing Greenhouse Gas Emissions

In addition to generating usable power for the local electric grid by capturing waste methane instead of releasing it into the atmosphere, the generators eliminate the equivalent of three times the carbon pollution created by the resort each year. In doing so, the project creates carbon offsets (a guarantee that a certain amount of carbon dioxide, or its equivalent, has been destroyed) that the utility purchases and uses to reduce the carbon intensity of its power.

Since this project started in 2012, it has prevented the emission of 250 billion cubic feet of methane annually into the atmosphere. This is equivalent to:

- Over 3 million hot air balloons full of methane destroyed annually
- 2,392,000 tons of CO_2
- Emissions sequestered by over 3 million acres of U.S. forest in one year
- Removing 517,000 passenger vehicles from the road for a year

Financial Return

Generating electricity from waste methane at this coal plant required a $6 million investment, including $5.34 million from ASC. It currently produces between $100,000 and $150,000 in revenue per month from electricity and carbon credit sales to Holy Cross Energy.

Compared to the $1 million per day that the Elk Creek Mine was making from coal when operational, this isn't much. But the project has almost paid for itself, and there is no doubt it was the right thing to do for the environment. After ten years, ASC has only about $750,000 remaining to pay off the investment.

The Biden Era: New Methane Regulations Are Coming

The Trump administration rolled back Obama-era methane regulations that mandated, among other things, common-sense measures like monitoring and fixing methane leaks by oil and gas companies. Environmental groups reeled, and even a few big companies like Shell and BP urged the Environmental Protection Agency to maintain the regulations. In July, a federal court struck down Trump administration rollbacks aimed at weakening methane limitations on public land. But U.S. oil and gas companies are lagging behind their European counterparts.

On his first day in office, President Biden signed an executive order creating a working group on the social cost of greenhouse gasses that will determine metrics for the social cost of carbon, nitrous oxide, and methane. His campaign notes that he'll require methane pollution limits for new and existing oil and gas operations, among other new regulations. He is under pressure to act quickly, and the technology exists to slash methane to 65 percent of 2012 levels by 2025.

Gina McCarthy, White House domestic climate change advisor, is spearheading an effort to decarbonize the U.S. power sector by 2035 and the whole economy by 2050, and she has already started discussions with the utility and automobile sectors about reducing greenhouse gas emissions.

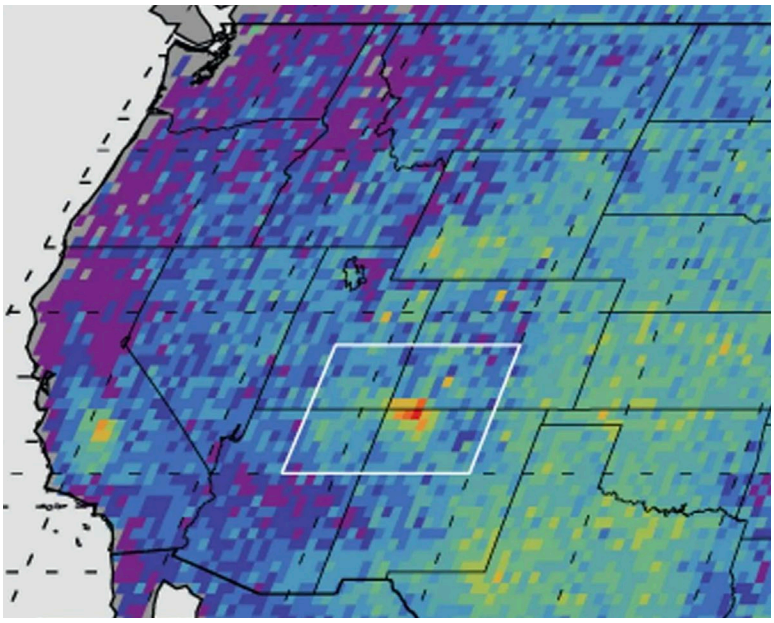
In Colorado – which could serve as a model for the new federal restrictions on oil and natural gas development – U.S. Senators Michael Bennet and John Hickenlooper, along with U.S. Representative Joe Neguse, just reintroduced the Colorado Outdoor Recreation Economy (CORE) Act, which would direct the Interior Department's Bureau of Land Management to "develop a program to facilitate the sale and delivery of methane from active, inactive, and abandoned coal mines" in several areas, including the North Fork Valley, where the Elk Creek Mine is located.

Coal Mine Methane Capture: Just One Way to Destroy Harmful Methane

The Environmental Protection Agency says that oil and gas emits eight million metric tons of methane annually. However, a five-year study conducted by the Environmental Defense Fund in partnership with 140 research and industry experts found that the figure is actually 13 million metric tons – 60% – higher than the EPA's estimate.

Methane from anaerobic decay of plants is also stored in huge volumes in bogs, lakes, and the ocean in the frozen north, and there is enormous concern in the scientific community that a melting Arctic will release these reservoirs, further warming the planet and creating positive feedback loops. That's why preventing methane leakage from any source is so important.

Coal mine methane capture is popular throughout the world – in particular in places with stricter carbon regulations and a history of underground mining, such as Germany, France, and England. It's also commonplace in China, where energy needs are high. In France, one methane capture project has been running since the 1970s.



A satellite image released by NASA shows the Four Corners area of New Mexico as a hot spot for methane emissions.
JPL-Caltech, University of Michigan via NASA

The U.S. currently lacks nationwide regulations or incentives to capture methane, but that is changing. California's Cap and Trade program purchases carbon offsets from a different project at the Somerset site, and those offsets are what make the methane destruction possible. In the future, it may be more profitable (and still good for the environment) to flare waste methane and sell the credits into a carbon market.

Whether through energy generation or flaring, methane destruction is critical to the climate fix, not only because of the gas's greenhouse potential, but also because there is so much of it leaking all over the country, from oil and gas operations, coal mines, fracked gas wells, and natural seeps. In fact, there's so much methane leaking from the southwestern United States that it's visible from space.

Conclusion

The last seven years have been the hottest in the global temperature record. As planetary warming accelerates, there is little time left to develop and implement solutions to prevent us from reaching irreversible tipping points. If businesses worked toward phasing out their reliance on fossil fuels and dramatically reducing their greenhouse gas emissions – in addition to holding elected officials accountable for national emissions-reductions strategies – we could be on track to meet the goals of the Paris Accord and do our part to stop global warming.

Aspen Skiing Company's methane project passes two tests of meaningful climate action. First, it's at a large, not a token, scale. And second, it is a high-profile, replicable model for others. While it is not a comprehensive market or policy solution, it illuminates a path in that direction and is an example of what one company can do to make a difference.

Learn more about Aspen Skiing Company's sustainability initiatives here.