Two decades ago, this bridge in the Swiss Alps did not exist.
Instead, a glacier allowed hikers to cross the valley.
A warming climate melted the ice. Its retreating edge is visible in the distance.
Now the Swiss have a plan to make use of the valley left behind.
Where Glaciers Melt Away, Switzerland Sees Opportunity

Henry Fountain, a New York Times climate reporter, and Ben C. Solomon, a Times multimedia reporter, traveled to the Alps to see how glacier melting affects hydropower. Maps by Jeremy White

Feb. 14, 2019
For hikers looking for a daylong outing in central Switzerland, the Trift Glacier bridge is a popular destination. It’s a short gondola ride from the village of Gadmen, followed by a few miles’ trek up a rocky path overlooking a granite gorge.

Those who successfully fight off a case of nerves — the slender cable-and-plank bridge is more than 500 feet long and 300 feet in the air — are rewarded with spectacular views. But the Trift Glacier itself is hardly to be seen. Its leading edge has retreated rapidly this century, leaving an opalescent lake behind.

The Trift is a casualty of climate change, one of tens of thousands of glaciers around the world that are shrinking as the earth warms. Melting glaciers are adding to rising sea levels and causing floods, and will eventually mean less water for drinking and agriculture.

But glacial retreat will also have an impact on hydropower, as glaciers shrink to the point where meltwater flows start to decline.
That may strain energy supplies, since, worldwide, about 16 percent of electricity is generated by flowing water.
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One of those plants is fed by meltwater from the Aletsch Glacier, the longest in the Alps.
The water collects behind the Gebidem arch.
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Then it travels 2,000 feet down the mountain through a tunnel to the generating plant.
Even the plant itself is carved out of the mountain.
The water spins turbines attached to generators.
Thick cables carry the electricity to the grid.
All told, hydropower plants like this one, in the town of Bitsch near the Rhone River, supply 60 percent of Switzerland’s electricity. (By comparison, the United States gets about 7 percent of its electricity from hydropower.)

Rain and melting snow are often the main sources of water for hydropower, but in Switzerland and many other countries the melting of glacier ice is an important contributor. And those glaciers are now melting fast.

In Switzerland, where the Alps are warming faster than the global average, most of the country’s 1,500 glaciers have retreated every
year since 2001; many are expected to all but vanish by 2090. The
great melting was especially bad in 2017, when 20 monitored Swiss
glaciers lost about 3 percent of their volume because of a dry winter
and an extremely hot summer. Last year was bad as well, according

“When we designed the first power plants in Switzerland in the
middle of the last century, we didn’t talk about climate change,” said
Florian Widmer, an executive with Alpiq, a Swiss power company
that is the largest shareholder in the Bitsch plant. Now, he said,
companies like his must plan for a future of little or no glacial
meltwater.
thick, could lose 90 percent of its ice by 2100.

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For now, accelerated melting in many glaciated regions, including the Alps, is increasing stream flows and filling reservoirs faster, leading to greater electricity generation. In Switzerland, for example, a recent study showed that loss of glacial mass because of the warming climate has increased hydropower production by 3 percent to 4 percent since 1980.

“Today, we benefit from glacial melting,” Mr. Widmer said.

But eventually the ice will retreat so much that stream flows will decline and power production will drop. Reduced glacial meltwater will also affect the timing of peak flows to many hydroelectric plants, forcing power companies to adjust output seasonally.

Although climate forecasts suggest that, in coming decades, Switzerland might make up for some of its lost ice with increases in rain and snow, retreating glaciers are expected to lead to as much as a 5 percent decline in electricity production in some regions of the country.

Already, the need for environmental flows — releasing some water from dams to maintain the ecological health of a river — cuts into hydropower production. And Switzerland faces another problem of its own making. Amid widespread public opposition to nuclear power following the 2011 Fukushima accident in Japan, the Swiss government has pledged to gradually phase out the country’s five...
reactors. Those reactors provide nearly all the rest of Switzerland’s power, and they are especially important in winter, when hydropower production drops and energy demand increases.

The government’s energy strategy calls for increases in wind, solar and geothermal power, which currently make up a small share of electricity production.

But the Swiss are also counting on hydropower companies to expand production, even though glacial meltwater will eventually decline.
Climate change offers opportunities, like here at the Oberaletsch glacier, near the Aletsch.
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When glaciers grow and advance, their abrasive power — the weight of massive amounts of ice mixed with rock debris — carves valleys in the landscape. As glaciers retreat, these valleys are exposed. Some of them may be ideal sites to collect and store water for hydropower.

Swiss researchers have studied the country’s glaciers and, using radar, the underlying bedrock, with an eye to locating potential new reservoirs. “We’re looking at what is going to be the future topography,” said Robert Boes, an engineer and director of the Laboratory of Hydraulics, Hydrology and Glaciology at the Swiss Federal Institute of Technology in Zurich.

Other criteria are evaluated as well, including potential construction costs, how much energy could be generated and whether the quantity...
of sediment — retreating glaciers leave a lot of that behind as well — would harm turbines or cause other problems.

At the Oberaletsch there is a suitable spot below the glacier’s leading edge, or tongue. Although it is still covered by up to 650 feet of ice, by the middle of the century the ice is expected to be gone and a long, thin lake will appear in its place. That will collect meltwater from what remains of the Oberaletsch, as well as runoff from rain and melting snow.

Engineers with Alpiq have proposed building a new generating plant at the existing Gebidem dam reservoir and tunneling up to a spot under the Oberaletsch where the lake will form. Everything, including the plant, would be inside the mountain to reduce the visual and environmental impact. Mr. Widmer said that the company was in discussions with government agencies about the project.
Then it would flow to the existing plant and make more electricity there.
At the Trift Glacier, the ice that once filled much of the valley is already gone, replaced by a natural lake. Another hydropower company has plans to make it even larger.
“We saw 10 years ago that it was a lake,” said Daniel Fischlin, chief executive of the company, Kraftwerke Oberhasli, or KWO. “That started the idea — there’s a really narrow place, and there you can build a dam.”

The dam would be built in the narrow gorge at the outlet of the lake.
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As with the Oberaletsch project, the water would travel by tunnel to a new generating plant farther down the mountain.

The reservoir and plant would serve as backup power, in effect, for periods when electricity shortages threaten to destabilize the power grid.

“It will be like insurance that you can operate for several days,” Mr. Fischlin said. Such sources of additional power will increasingly be needed as Switzerland moves away from nuclear power and as climate change alters precipitation amounts and patterns.

After four years of discussions with environmentalists, ending with an agreement, KWO has begun the permitting process. Construction could start by 2022 and be finished by 2030.

By then, even less of the glacier will remain.
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