

OFF THE GRID

CLEAN POWER FOR OFF-GRID APPLICATIONS



WHAT TEXAS SHOWS US ABOUT MICROGRIDS

We've all seen the pictures and heard the news, as extreme cold weather essentially took down the Texas electrical grid, leaving millions without power. An article in [The Conversation](#) by Thompson Rivers University (Canada) Professor Michael D. Mehta explains how this highlights the advantages of shifting to microgrids.

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THIS MONTH'S FEATURE:

HAWAII SHOWS THE WAY

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AIR POLLUTION KILLS MORE THAN COVID IN THE WORLD'S BIGGEST CITIES

Although reduced economic activity due to the Covid-19 pandemic has led to a temporary fall in air pollution in many parts of the world, smog was still a big killer in 2020. This surprising finding comes from a study by Greenpeace and Swiss air quality technology firm IQAir, as reported in [Eco-Business](#).

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247SOLAR *Heat2Power*™ TURBINE

Last issue, we described one component that makes 247Solar Plants possible — their low-cost thermal batteries. Here's another component — we call it our *Heat2Power*™ Turbine. It's the first-ever commercial turbine able to produce power from ambient-pressure hot air without combustion or emissions. It can also burn a variety of fuels, including hydrogen, to provide 24/7 dispatchability without the need for backup gensets.

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WHAT TEXAS SHOWS US ABOUT MICROGRIDS

We've all seen the pictures and heard the news, as extreme cold weather essentially took down the Texas electrical grid, leaving millions without power and forcing President Joe Biden to declare a state of emergency.

An article in [The Conversation](#) by Thompson Rivers University (Canada) Professor Michael D. Mehta explains how shifting to microgrids at the community level can both increase reliability and drive down carbon emissions when renewable energy is used. Says Mehta, "When a microgrid goes down, it only affects the local region and not an entire state or province. Because of their scalability and flexibility, microgrids may be less expensive to build when compared with energy mega projects ... Additionally, they may fit better with the wants and needs of communities, generate local employment opportunities, lower consumption of electricity and take advantage of regional energy sources."

Read the full article [here](#).

AIR POLLUTION KILLS MORE THAN COVID IN THE WORLD'S BIGGEST CITIES

Although reduced economic activity due to the Covid-19 pandemic has led to a temporary fall in air pollution in many parts of the world, smog was still a big killer in 2020. This surprising finding comes from a study by Greenpeace and Swiss air quality technology firm IQAir, as reported in [Eco-Business](#).

"The fact that poor air quality claimed an estimated 160,000 lives in the five largest cities alone should give us pause, especially in a year when many cities were seeing lower air pollution levels due to less economic activity," says Frank Hammes, chief executive of IQAir.

Aidan Farrow of Greenpeace Research Laboratories tells [Eco-Business](#) that the research demonstrates the need to urgently scale up clean energy, build electrified, accessible transport systems, and end reliance on polluting fossil fuels.

Read more [here](#).

247SOLAR Heat2Power™ TURBINE

The first-ever commercial turbine able to produce power from ambient-pressure hot air without combustion or emissions

247Solar Plants™ combine with PV or wind plus batteries to create a simple, reliable off-grid solution for continuous clean electricity. Last issue, we described one component that makes 247Solar Plants possible — their low-cost thermal batteries. Here's another component — we call it our *Heat2Power*™ Turbine.

In a 247Solar Plant, sunlight is concentrated to heat air at atmospheric pressure to almost 1000°C. This super-heated air is supplied to the turbine, where it passes through a proprietary high-temperature heat exchanger. This transfers the heat to compressed air from the turbine, which uses this super-heated compressed air, rather than steam, to produce electricity. No fuel is required and no emissions are produced by this process.

Our *Heat2Power* turbine is based on an off-the-shelf Capstone® turbine modified to 247Solar specifications. It is a standardized module of 200 kWe capacity, and two are used in each 247Solar Plant. Although no fuel is required for normal operation, an external combustor can be added to burn a variety of fuels, including hydrogen, to provide 24/7 dispatchability without the need for backup gensets.



HAWAII SHOWS HOW IT'S DONE

US state is ahead of schedule for renewable power adoption

Our focus is generally off-grid applications of renewable energy, but we were inspired by a recent article in [Greentech Media](#) about extraordinary progress being made in the state of Hawaii. Since one could say, tongue in cheek, that all of Hawaii is an off-grid application, we're going with it.

It turns out that Hawaii has instituted a mandate that 30 percent of electricity generation must come from renewable sources as of 2020. But According to GTM, the state's utilities have already exceeded that figure.

Hawaiian Electric, the state's largest utility, reported this month that its 2020 generation mix reached 34.5 percent renewable across Oahu, Hawaii Island, and Maui. Renewable production rose 13 percent from 2019. The article quotes spokesperson Shannon Tangonan as saying, "It's a culmination of so much work that we've put into building our renewable portfolio. We're reaping the benefits of staying true to (our) goals."

Better still, on Kauai (pop. 66,000), the Island of Kauai Utility Cooperative (KIUC) expects that the results are likely to show that its electricity mix is more than 60 percent renewables. That exceeds both the state's 2020 requirement and KIUC's strategic goal of 50 percent renewables by 2023.

Challenging assumptions

GTM points out that this challenges the assumption that states could never commit themselves to 100 percent carbon-free electricity. Hawaii was first to pass a law to that effect, in 2015, that set a deadline of 2045. California later followed suit, as did numerous other states. However, such goals only matter if they lead to tangible deployments, and this is where Hawaii offers a valuable case study.

While the expense of shipping coal, fuel oil and diesel to Hawaii to burn in conventional power plants makes the economics of renewables more favorable there than on the mainland, the island state's example is still instructive for other geographies where fuel costs are relatively high. Rapidly falling solar and battery costs have allowed developers to make increasingly attractive proposals. In addition, large solar and battery projects will be powering up in the coming years.

A hybrid approach

Interestingly, Hawaiian Electric's results show that consumers are playing a role as well. Nearly half of Hawaiian Electric's renewable production came from "customer-sited, grid-connected" renewables, mainly rooftop solar. The next largest contributor was wind, followed by large-scale solar and biomass. Biofuels, hydro, and geothermal rounded out the renewable mix. Deployments of customer-sited renewables totaled 65.6 megawatts of new capacity last year, far more than any utility-scale projects.

Storage is key

As GTM makes clear, cheap solar can only carry a grid so far. Hawaiian Electric plans to add large-scale battery plants to store solar power and deliver it after the sun goes down. KIUC has already built several major battery plants and is turning next to a solar-powered pumped hydro storage facility. That project is projected to bring Kauai to [80 percent](#) renewable power by the mid-2020s. "As we get closer to 100 percent, it will get more difficult," Tangonan says. That's true of almost any endeavor, but clearly, Hawaii is setting an encouraging example.