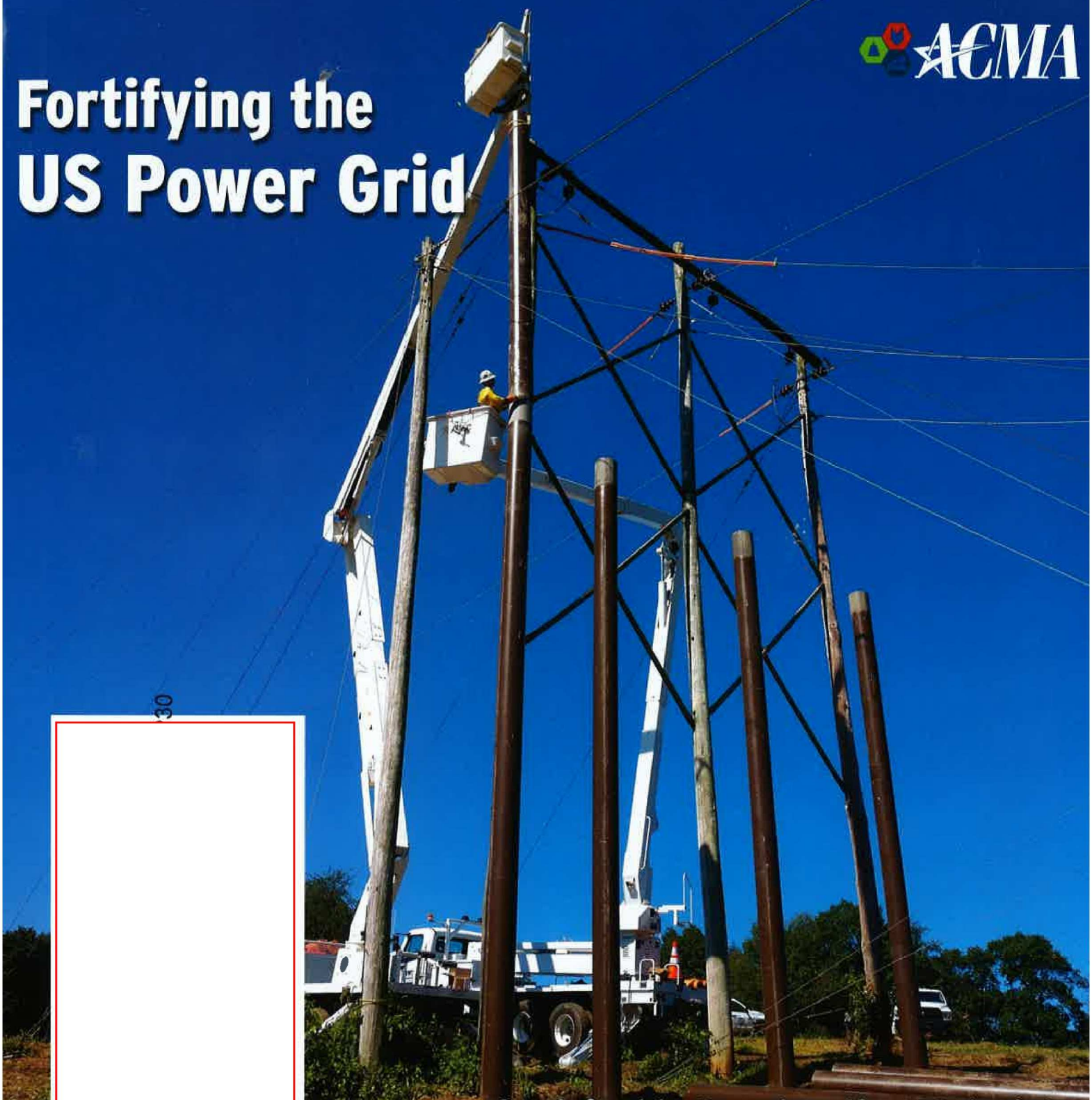
Summer 2024

CompositesManufacturing

The Official Magazine of the American Composites Manufacturers Association

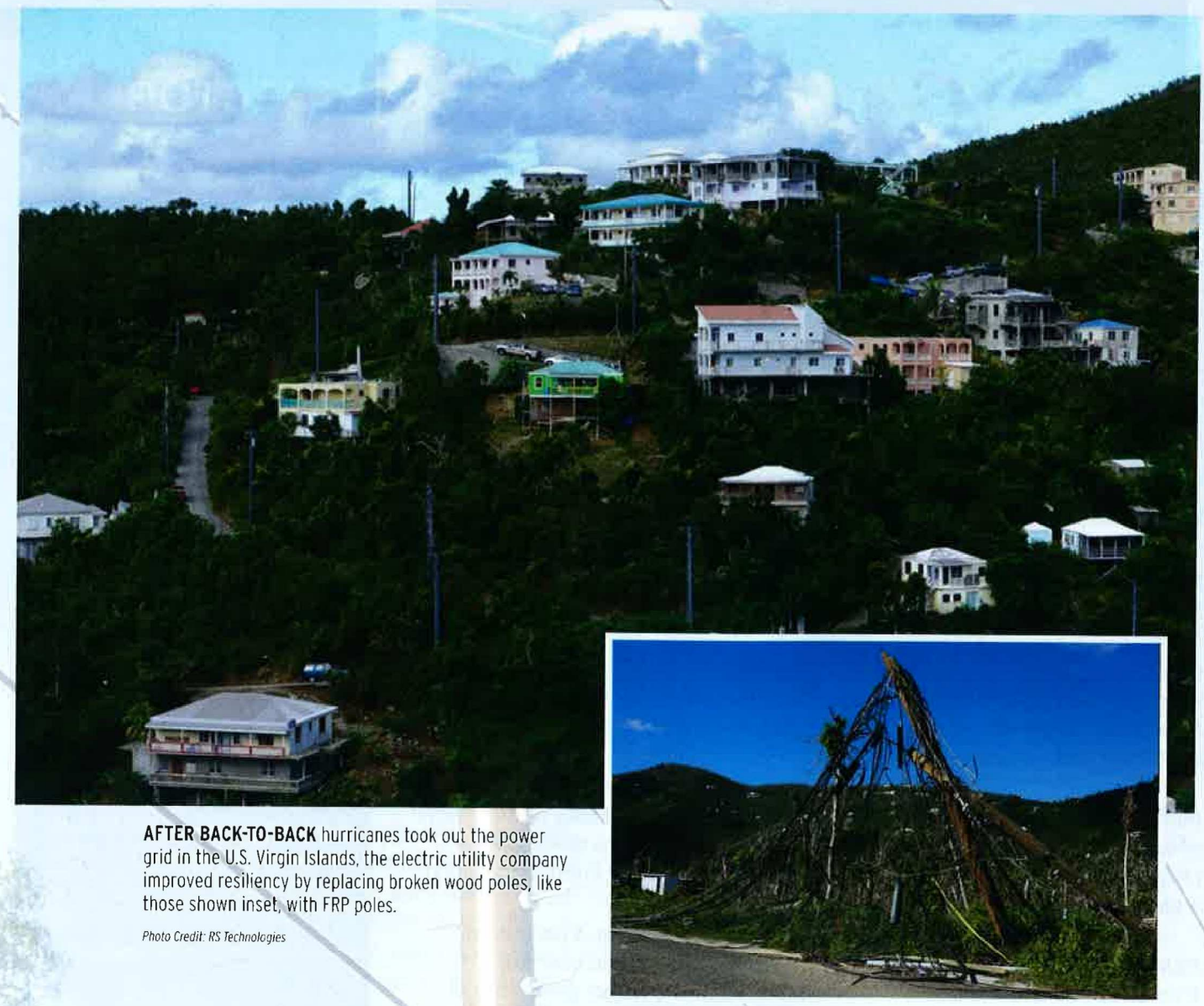
ACMA

Fortifying the US Power Grid



Sustainable Construction Materials

Advancements in Robotics



AFTER BACK-TO-BACK hurricanes took out the power grid in the U.S. Virgin Islands, the electric utility company improved resiliency by replacing broken wood poles, like those shown inset, with FRP poles.

Photo Credit: RS Technologies

Strengthening the Power Grid

Composite poles and crossbars keep distribution and transmission lines up and operating under difficult conditions.

By Mary Lou Jay

THE U.S. POWER GRID is straining under the triple burden of increased demand, aging infrastructure and severe weather. Between 2011 and 2021, the country's utility companies experienced 64% more major power outages than they had in the previous 10 years. The nonprofit Climate Central reports that 80% of those outages were caused by winter storms, hurricanes, tornadoes, wildfires and extreme heat.

Hardening and strengthening the grid is now a top priority for power providers and the federal government. The composites industry is part of the solution, providing FRP utility poles and crossarms that withstand weather events that routinely take out wooden ones.

Weather Tested

Composite electric poles have been around since the 1960s, but for years had only a small market share. During the last decade they have gained popularity because of technological improvements, as well as recognition among power companies of their effectiveness in reducing weather-related outages.

"Southern California Edison (SCE), the major electric utility in Southern California, went through a series of wildfires about six to seven years ago. They didn't previously have any robust wildfire mitigation plans; however, subsequent to those wildfires, SCE developed an industry-leading mitigation plan that has been successful in minimizing adverse effects of wildfires on its system," says Clinton Char, formerly with SCE and now transmission engineering manager at E|2 Consulting Engineers.

Working with composites manufacturer RS Technologies, SCE tested different materials to determine which would have the best chance of surviving high temperatures and high winds. The utility chose FRP poles with a wraparound FRP shield, which protects the integrity of the pole itself. SCE has already installed thousands of composite poles in high-risk areas and will continue to use them to replace wood poles where necessary.

In May 2024, almost a million CenterPoint Energy customers in greater Houston lost power after derecho winds of more than 100 mph blasted through the area. In a LinkedIn post, Jason Ryan, CenterPoint's executive vice president for regulatory services & government affairs, noted that the FRP poles the company had previously installed remained standing while wood poles did not. CenterPoint is now replacing hundreds of wood poles in this area with composite poles to avoid future outages.

In 2017, two major hurricanes took out most of the power grid in the U.S. Virgin Islands. In the following months, the territory's Water and Power Authority (WAPA) convinced the Federal Emergency Management Agency (FEMA) to waive its usual "like for like" replacement policy, which enabled the utility to install approximately 9,000 more resilient FRP poles in place of wood poles. The composite poles have withstood other storms, meeting WAPA's goal of providing residential customers and businesses a more dependable and resilient power supply.

Other utilities are taking notice. Scott Holmes, CTO of RS Technologies, says that some power companies hope to install FRP poles in their grids with money from the U.S. Department of Energy's Grid Resilience and Innovative Partnerships (GRIP) program. The goal of the $10.5 billion program, funded as part of the Bipartisan Infrastructure Act, is to improve the resilience of the power system. On Nov. 14, 2023, the Biden Administration announced up to $3.9 billion available through a second round of funding for fiscal 2024 and 2025.

Photo Credit: Creative Composites Group

COMPOSITE TRANSMISSION POLES are designed to carry larger and heavier wires and equipment than distribution poles.

Composite Benefits

Composite utility products require minimal maintenance and are lightweight, reducing transportation and installation costs. FRP poles don't attract insects or birds like woodpeckers, which can damage the structural integrity of wood poles.

Composite poles are inert, a big advantage over wood poles treated with preservatives that can be dangerous to humans and the environment. "In Maine, if a pole is going to be within 75 feet of a water source, one utility automatically earmarks that pole as a composite so it won't leach anything into the environment like a wood pole would," says Dustin Troutman, chief sales officer for Creative Composites Group.

FRP poles and crossarms are resilient under a variety of conditions. During winter storms they can bear much heavier ice loads than wood poles. In high winds that snap wood poles, FRP poles are flexible enough to bend.

RS Technologies manufactures all its FRP electric poles with a self-extinguishing polyurethane formulation that helps prevent the spread of fire. But for areas prone to wildfire, the company developed

the RS Fire Shield™ to encapsulate the lower portion of the FRP pole. The Fire Shield creates a sacrificial thermal barrier that helps maintain the pole's structural integrity during a fire.

FireStrong™ power poles from Creative Composites Group are also built with an insulating FRP sleeve. "Once the temperature gets above 400 degrees, a chemical reaction takes place, and the sleeve will start to char and release some moisture. It actually cools the pole itself," says Troutman. After a fire, utility crews can check the pole's four temperature labels to determine the maximum temperature to which it was exposed. That enables utilities to determine if the pole retains enough strength to continue in service.

Horizontal crossarms on utility poles decay faster than poles because moisture accumulates on them and because their surface area is more exposed to the sun. Composite crossarms can alleviate those problems.

"One of the benefits of composites is that we can look at the material solution," says John Higgins, CEO, RS Technologies. FRP crossarms designed with hydrophobic surfaces shed water and contaminants like road salt; UV-resistant resins in FRP crossarms provide additional protection from the sun.

Increasing Market Share

Although the price of composite poles has come down, they still cost two to four times as much as wood poles. But with the power industry's increased focus on sustainability, composite pole manufacturers can make the case for their long-term cost effectiveness. Some utilities limit costs by replacing every fifth wood pole with a composite pole to reduce cascading failures. Others save money by using FRP poles when they need to handle heavy switches and other electric equipment.

Composite poles do face competition from concrete, steel and iron poles. But heavy concrete poles are harder and more expensive to transport, limiting their range, and steel and iron poles have long lead times. Wood poles may be in short supply as well. Electric companies want sturdier, larger-diameter poles to improve grid resiliency, and it takes longer for trees to reach this size. In addition, poles built from newer wood are often not as strong as those made decades ago with old-forest trees.

Composite pole manufacturers have responded to growing interest in their products by ramping up production. Last year, RS Technologies opened a new 400,000-square-foot pole and crossarm production facility in Houston. With this facility, the company was able to preposition product in Texas, so poles were readily available when CenterPoint needed them for storm remediation.

Creative Composites recently expanded its telecommunications and transmissions product line and now offers poles with diameters ranging from 8 to 18 inches. "This enables FRP poles to be installed in broader applications while offering more sustainable, resilient solutions," says Troutman.

To grow composites' market share, the industry needs to continue to help develop codes and standards for these products and to promote case studies that communicate their successful deployment, Troutman says.

"We need more compelling evidence from utilities and their research partners that describe their experiences of FRP poles as compared to wood poles in hurricanes and other major weather-related events," he says. "We also need to focus more on the installer, and to continue to develop how-to training programs so that linemen are familiar with our products when they finish school."

Utility companies know that keeping the power on isn't simply a matter of convenience; it's vital to people's health and to a region's economy. FRP poles and crossarms can be key to maintaining that steady electric supply.

"There are absolutely places on the system where it just makes sense to use wood poles," says Higgins. "But FRP poles are an excellent choice where you have critical circuits, where you have the real risk of weather-related disruptions, be that fire, storm, woodpeckers or other naturally induced disruptions. There are places where you want to be able to put in a pole and not have to go back and touch it again for a long time." **CM**

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Setting New Standards

In 2019, ACMA released the NSI/ACMA Standard Specification for Fiber Reinforced Polymer Composites Utility Poles. Developed by ACMA's Utility & Communications Structures Council, the standard covers the manufacturing, assembly and installation of FRP poles.

ACMA's Utility & Communications Structures Council is currently undertaking the five-year, ANSI-mandated review of the standards. "The committee is working on upgrading the standards to do more to address resiliency, environmental sustainability and safety relative to handling and installing FRP utility poles," says John Busel, vice president of ACMA's Composites Growth Initiative. "It will present a major upgrade to the previous standard."

After sending out the draft FRP utility pole standard for review by end users, asset owners, manufacturers, academics and suppliers, the ACMA committee will determine what edits to make. Busel says the committee hopes to publish the updated standards in about a year.

The committee is also working on draft specifications for fiberglass crossarms for distribution utility structures.