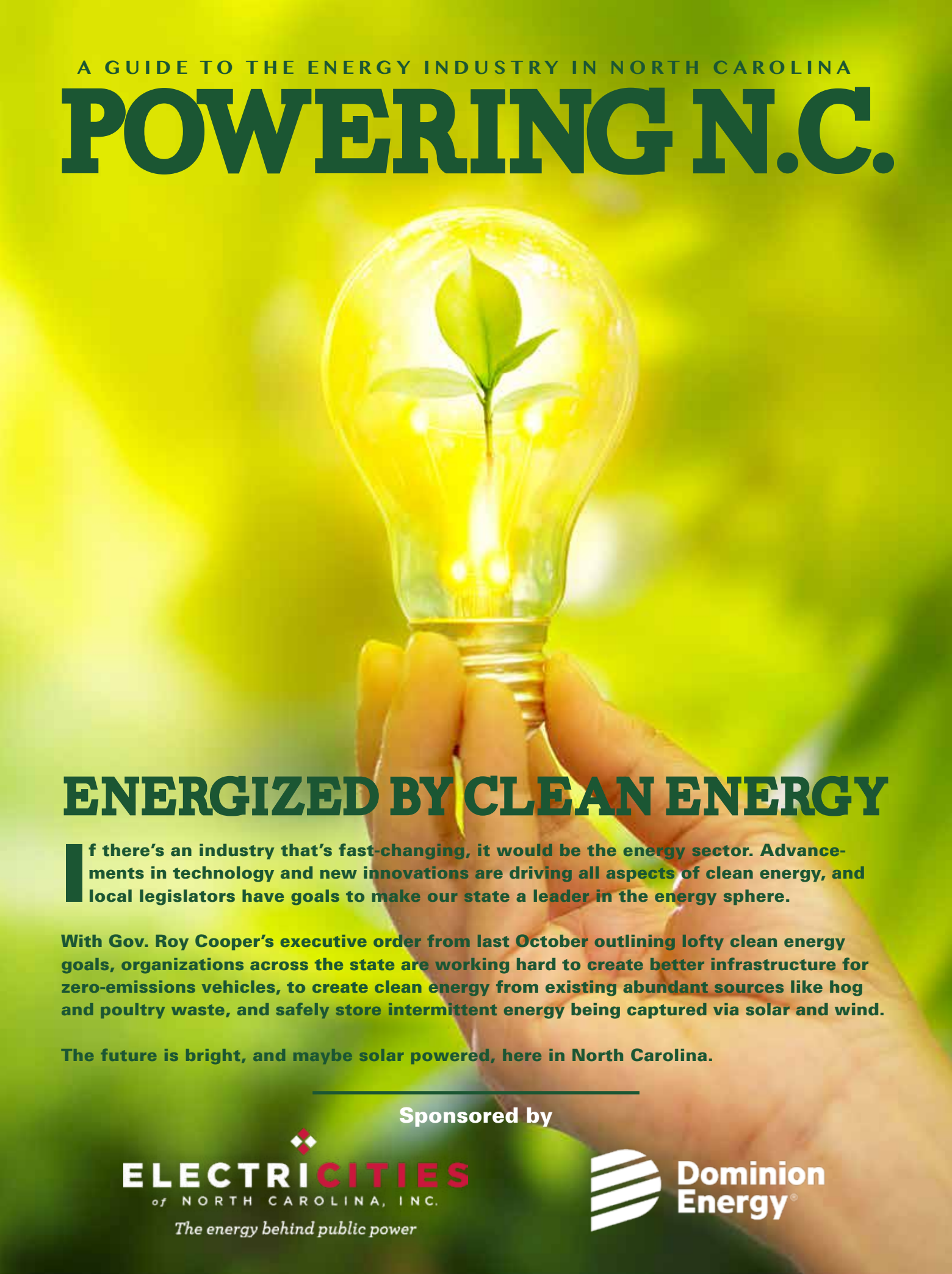
A GUIDE TO THE ENERGY INDUSTRY IN NORTH CAROLINA

POWERING N.C.



ENERGIZED BY CLEAN ENERGY

If there's an industry that's fast-changing, it would be the energy sector. Advancements in technology and new innovations are driving all aspects of clean energy, and local legislators have goals to make our state a leader in the energy sphere.

With Gov. Roy Cooper's executive order from last October outlining lofty clean energy goals, organizations across the state are working hard to create better infrastructure for zero-emissions vehicles, to create clean energy from existing abundant sources like hog and poultry waste, and safely store intermittent energy being captured via solar and wind.

The future is bright, and maybe solar powered, here in North Carolina.

Optima-KV in Kenansville was the state's first swine-waste natural-gas operation. Similar projects are popping up throughout the state to convert hog and poultry waste into clean energy.

CLEARING THE AIR

North Carolina aims to become a national leader in harnessing the power of animal waste to create a major renewable-energy source.

When it comes to raising swine and turkeys, North Carolina ranks among the top producers in the country – which means the state is also a chart-topper when it comes to animal waste. And that might be more valuable than one thinks.

Key partnerships among Dominion Energy, Duke Energy, farmers and local power producers are developing groundbreaking processes for capturing that waste and producing electricity and natural gas to power thousands of homes and businesses. These projects have the potential to make North Carolina a leader in renewable energy.

Dominion Energy, a Richmond, Va.-based electric utility that serves parts of North and South Carolina, announced a joint venture with Virginia-based Smithfield Foods to form Align Renewable Natural Gas in November 2018. The program captures methane emissions from hog farms and converts them into renewable energy. This year, the focus is on North Carolina.

Last October, the two companies invested an additional $250 million for Align RNG. A total of $500 million has been poured into the project since its beginning, and about $375 million has gone into North Carolina.

Construction began in January for the first major N.C. development, the Grady Road Project, within a 30-mile radius in Duplin and Sampson counties near Warsaw. The initial operation involves collecting methane from three Smithfield-owned farms and 16 separate operations that contract with Smithfield to raise hogs. The 19 farms produce a combined 250,000 hogs annually.

"North Carolina is making great strides in clean energy, and we can continue to lead the way," says Ryan Childress, director of gas business development for Dominion Energy.

The Renewable Energy and Energy Efficiency Portfolio Standard law in North Carolina requires utilities to use renewable sources to produce a percentage of the power they sell. While solar and wind are the dominant sources, the law also requires generating power from poultry and swine waste.

Natural byproducts — including hog manure — produce methane, which has raised environmental concerns because it emits about 25 times more greenhouse gas than an equal amount of carbon dioxide. The Align RNG process will capture about

105,000 metric tons of methane each year and create a carbon-negative fuel, which is the equivalent of taking half a million cars off the road or planting 40 million trees annually, according to Dominion Energy.

Cavanaugh & Associates PA, a Winston-Salem-based engineering firm specializing in water efficiency and converting waste to energy, is the construction contractor for Align RNG. Cavanaugh was also the designer and contractor for North Carolina's first swine-waste natural gas operation in Kenansville. That site is called Optima-KV and is owned and operated by Optima BioEnergy of Wilmington.

The process involves covering lagoons to collect swine waste and breaking it down using anaerobic digesters, or large coverings resembling tarps. The digesters capture methane from the waste and feed it into low-pressure piping, which transports the methane to a processing plant. The methane, which is about 65% natural gas, is refined and inserted into the pipeline system operated by Piedmont Natural Gas, a subsidiary of Duke Energy.

"Farmers will be able to invest in this initiative by installing metered digesters on their farms and contracting with Dominion to sell the gas they produce," says Kraig Westerbeek, senior director of Smithfield Renewables and hog production division environmental affairs for Smithfield Foods. "They quickly will receive a return on their investment and will grow their revenue and profits."

Officials predict the Grady Road project will be fully operational by the end of 2020. Align's next project in North Carolina will involve more than 30 farms in Duplin County.

Future projects in other parts of the nation will roll out over the next eight years. By the end of 2028, the current $500 million investment will provide enough energy to heat 70,000 homes and businesses, according to Align RNG.

Meanwhile, Duke Energy is working on a separate project involving turkey droppings alongside Power Resource Group, which opened the Carolina Poultry Power waste-energy plant in Farmville in October. It's a $32 million facility that will consume more than 230 tons of poultry litter per day to generate 2 megawatts of energy and 750,000 tons of steam per hour, enough to power about 13,000 homes, according to CEO Rich Deming.

North Carolina is the second-largest turkey-producing state behind Minnesota, employing 39,000 workers and producing 32.5 million turkeys per year, according to the National Turkey Federation.

The system is interconnected to the Pitt and Greene Electric Membership Cooperative local grid. The co-op organization, along with Duke Energy, will purchase energy credits from the facility.

"North Carolina has built a powerhouse turkey industry, which creates a high level of waste products. Converting this waste to energy will solve waste disposal problems and help the state hit its renewable energy levels," Deming says.

Funding for the Carolina Poultry Power project was provided by Pittsburgh-based First National Bank, a private equity fund and various partners and investors, Deming says. His company has significant expansion plans. "Our plan is to build, own and operate a lot of these facilities, so I have to stay focused on acquiring sites and working with other partners," he says. "Distributing energy from animal-waste material is the wave of the future." ■

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Actions Speak Louder

CLEAN CARS

A zero-emission vehicle plan positions North Carolina to lead the way in clean energy.

The state is making huge strides toward updating infrastructure and educating residents to prepare for a major increase in the number of electric vehicles on the road.

North Carolina's road map to dramatically reducing carbon emissions and becoming a clean energy leader took a big step forward last October when Gov. Roy Cooper released an executive order that included bold goals for promoting zero emission vehicles or ZEVs.

The order outlines Cooper's ambitious clean-energy economy goals, including increasing the number of electric vehicles in the state to at least 80,000 by 2025. With just 16,000 ZEVs on North Carolina's roads and highways today, that goal represents a 500% increase over five years.

The Southern Alliance for Clean Energy called the ZEV plan the first of its kind in the Southeast and named North Carolina as a newly established transportation leader, according to an October statement by the Knoxville, Tenn.-based nonprofit environmental group.

"Reaching 80,000 electric vehicles in North Carolina by 2025 is an ambitious goal, but I'm confident we can make or even exceed it," says Heather Hildebrandt, the Department of Transportation's state initiatives group supervisor.

The biggest hurdle the state faces is educating the public, Hildebrandt adds. Many people believe it is too expensive to purchase and operate an electric vehicle, and vehicle-charging stations are scarce.

"People who shop for cars tend to be more focused on the sticker price than the operating costs over the life of their vehicle," she says. "ZEVs are cheaper to operate. They don't need oil changes, there's no fuel cost, and there are fewer parts to wear out."

Statistics from the U.S. Department of Energy back this up. An online calculator compares North Carolina's average gas price of $2.36 per gallon to the cost of an equivalent "e-gallon" rate of $1.10. In some places, utilities offer cheaper rates at night, which could reduce operating costs even more. In addition, the federal government offers tax credits to consumers who purchase electric vehicles.

"In North Carolina the cost savings of using electricity-power vehicles compared to gasoline translates to an average savings of $800 to $1,000 per year," says Jacob Bolin, project manager for Advanced Energy, a nonprofit energy-consulting firm in Raleigh that focuses on energy efficiency and renewable energy.

"In the business community, we see a lot of interest in electric vehicles from the major players such as Amazon, FedEx and UPS who are making an investment," he says.

Advanced Energy is working with organizations in North Carolina that manage fleets, such as municipalities and universities. "UNC Charlotte is working to electrify all of its vehicles," he says. "The [Raleigh-Durham International] Airport currently operates four electric parking shuttles, and the cities of Greensboro and Asheville are making strides too."

In 2018, the city of Greensboro received a $1.9 million grant from the Federal Transit Administration to buy 16 battery-electric buses, equivalent to 30% of its fleet. Meanwhile, Asheville recently purchased five electric buses.

Last year, Duke Energy proposed a $76 million investment in ZEV infrastructure, such as charging stations, marking the largest in Southeast history. The proposal is awaiting approval from the N.C. Utilities Commission. North Carolina now has about 600 public charging stations and Duke's program would more than double that number, according to Lang Reynolds,

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the company's director of electric transportation.

Besides the savings in gas and maintenance costs, experts say using electric vehicles will make operating costs more predictable. "Gas costs are market sensitive and fluctuate, but electricity pricing is more consistent," Hildebrandt says. "Using electric vehicles makes budgeting more accurate."

One challenge drivers may see in a marketplace with easy access to gas stations is learning how to charge their electric vehicles with enough power to get to their destinations.

For most drivers, vehicle charging depends on the need, and home-charging stations may be enough, according to Bolin. Customers with short commutes can purchase a Level 1 charging cord and a plug that will fit in a standard wall outlet.

"It charges slowly, and you get a four-mile range per every hour you charge the battery," he says. Eight hours of charging yields about 32 miles of driving.

A Level 2 station involves upgrading your home-electric utility, so vehicle charging is twice as fast, yielding 10 miles per charging hour. Most commercial charging stations are at Level 2. Fast-charging stations are for travelers on road trips. They can charge a vehicle battery up to 80% in 30 to 45 minutes.

"Statistics show that if an individual has access to a charging station at work, they are seven times more likely to purchase an electric vehicle," Bolin says.

With careful planning, most drivers can navigate local driving without difficulty, Reynolds says. "Most drivers charge their vehicles the way they charge their phones," he says. "When they are not using their car, they plug it into a charging station and rarely let their battery run completely down."

In addition to the mandate to increase the number of registered ZEVs in the state, Cooper's executive order also calls for reducing statewide greenhouse-gas emissions to 40% below 2005 levels and reducing energy consumption in state-owned buildings by at least 40% from fiscal year 2002-03 levels.

The Southern Alliance calls these goals the most impressive in the Southeast and say they position North Carolina as a player on the national climate policy stage, adding that the electric-vehicle directive is the lynchpin.

The agencies collaborating to achieve those goals are determined to meet them. "We are working hard to reach the state's electric-vehicle mandate over the next five years," Reynolds says. "I see a bright future." ■

EFFICIENT ENERGY

Battery-storage technology is key to providing economic power sources for consumers.

A microgrid installed on Ocracoke Island couldn't stop Hurricane Dorian's heavy wind and flooding from knocking out power in September, but it was instrumental in getting the island up and running after the floodwaters subsided.

Ocracoke Island's remote location is isolated from central power-generation sources and leaves the island vulnerable during weather events. A microgrid is a small electric system that combines local energy resources and control technologies to provide power when needed. It's connected to the main grid, but can operate independently.

The island's service provider, Tideland Electric Membership Corp., restored power through the local microgrid on Sept. 10, just four days after the storm.

"These microgrids allow users to disconnect from the main grid and provide a steady flow of electricity to address demand," says Lee Ragsdale, senior vice president of energy delivery at North Carolina's Electric Cooperatives, a Raleigh-based group of 26 not-for-profits that provide power for 2.5 million residents in 93 counties. "They put excess power into storage for use when needed, such as during storms or other natural occurrences that interrupt electricity, or if demand exceeds availability."

The Ocracoke site is one of two pilot projects by the state co-ops. The other is in Lillington and is a collaboration with a local electric co-op, South River Electric Membership Cooperative, and Butler Farms, a hog operation.

The Butler Farms microgrid incorporates alternative-energy sources, including biofuel from swine waste, solar energy and battery storage. In addition to using the electricity it generates, the farm also sells power it produces to South River.

Fifteen years ago, technology wasn't available to enable this type of large-scale energy storage, says Jim Hoelscher, president of LS Energy Solutions of Charlotte. Renewable energy sources such as solar and wind power required the technology to advance quickly. Because solar and wind power are intermittent energy sources, energy-storage components such as those found in microgrids allow for reliable and consistent power.

"Energy storage is an imperative to using clean energy," Hoelscher says. "There is a great demand in remote areas where it is expensive for utilities to run power lines. But you can put renewable-energy generators paired with energy storage systems to get power to consumers."

The N.C. co-ops are partnering with Hyde County egg producer Rose Acre Farms and its local electric cooperative, Tideland EMC, to develop an agricultural microgrid, according to Ragsdale.

The project will integrate solar panels, energy storage and other components with resources from the farm to create a microgrid capable of generating its own electricity during times of power loss. It will also be connected to the main grid to diversify traditional power resources and improve reliability.

Ragsdale says the improving technology enables the state's co-ops to meet local needs and making more economically feasible to develop and install systems in rural communities, farms and even on islands.

"Across the country, power providers are transitioning from a main grid to local microgrids to get electricity closer to where people are," he says. "Energy storage is the key technology to be able to do this, and it holds great promise." ■

— Teri Saylor is a freelance writer from Raleigh.

Microgrids, like the one on Ocracoke Island, allow for the safe storage of clean energy in the event of major weather or other power outages.

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A NIGHT OUT ON THE TOWN

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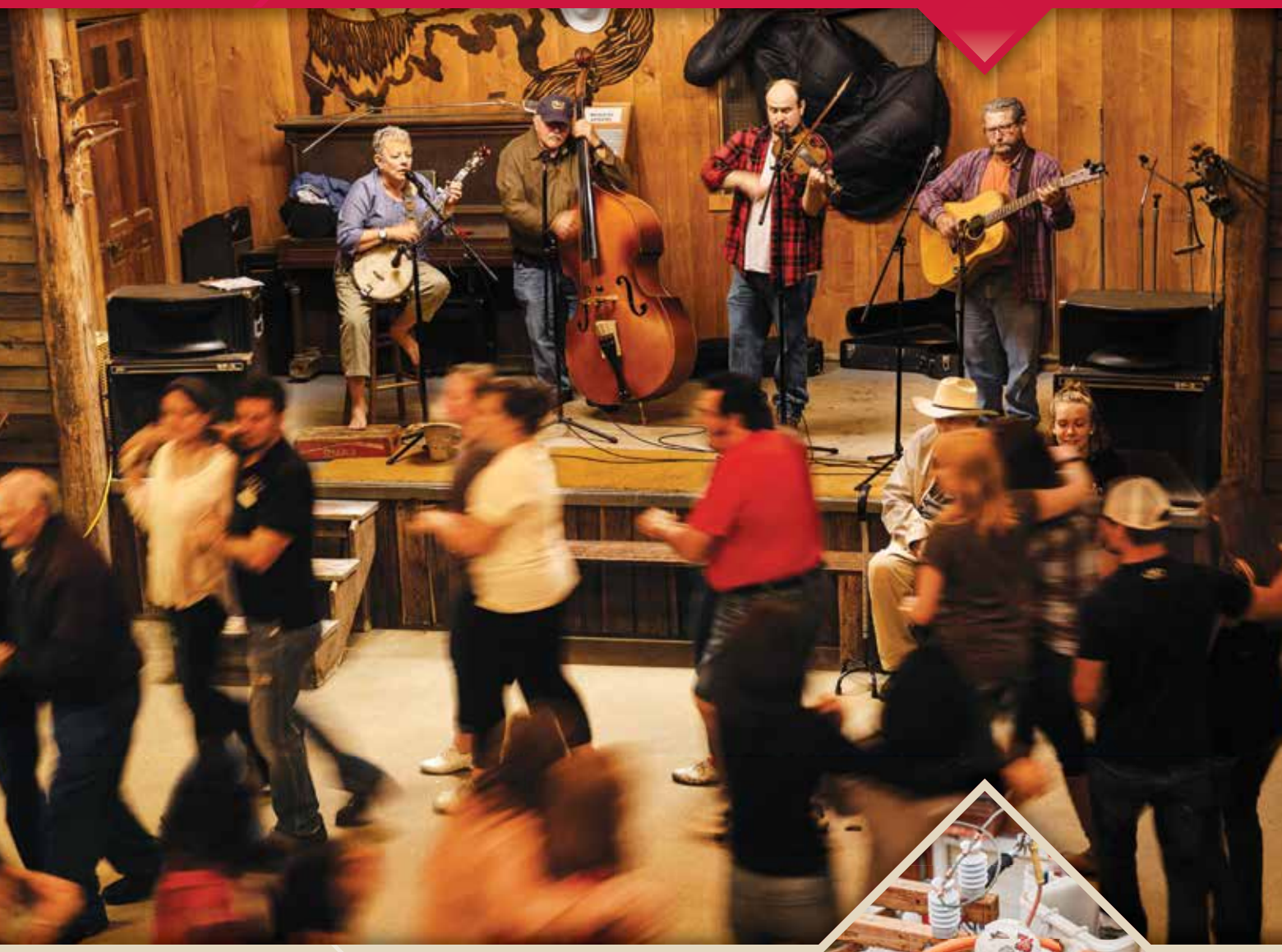

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