



ANNUAL REPORT
2023

HELPING BUSINESSES COMPETE: DECARBONIZATION, EFFICIENCY AND ELECTRIFICATION

The energy landscape is undergoing rapid change as we move to cleaner, lower-carbon energy sources. Companies across the country, and right here in North Carolina, are setting bold goals and taking big steps toward decarbonization. Recognizing that there is no one-size-fits-all solution, we've had the opportunity to partner with businesses to help them identify the most suitable and cost-effective paths forward.

In 2023, we used our decades of experience to provide unbiased recommendations and services across a suite of decarbonization areas: energy assessments, electrification, ISO 50001, renewables and electric transportation. We were on the ground and on-site guiding organizations through energy management certifications, distributed energy resource installations, charging infrastructure plans for electric vehicles (EVs) and more to help them improve their sustainability and save money along the way.

In the pages that follow, learn more about these accomplishments and the other ways we worked toward our vision to ensure that energy is clean, affordable, reliable, efficient and safe for all people.

SUCCESS IN STRATEGIC ENERGY MANAGEMENT

We continued efforts to provide technical consulting to help commercial and industrial customers achieve 50001 Ready recognition, earn initial third-party ISO 50001 certification and retain ISO 50001 certification through documentation updates, internal auditing and additional support.

We worked with Granges Americas Inc. in Newport, Arkansas, as the site achieved ISO 50001 certification in August, and we are currently supporting their facility in Huntingdon, Tennessee. We also maintained our relationship with Daimler Truck North America, assisting them with their corporate internal ISO 50001 audits.

In November, we started a new ISO 50001 certification project with Indeed Inc. in Austin, Texas. This project is our first time applying the ISO 50001 certification standard to a high-rise office building, and it also includes an energy assessment and electrification study for a commercial kitchen and domestic hot water. Indeed has an aggressive goal of being carbon neutral by 2030, and our work will help them meet their target.

Additionally, we utilized the platform of the U.S. Department of Energy's (DOE's) 50001 Ready program with federal cohorts and a statewide effort for customers of our utility member Duke Energy. In 2023, 46 sites (with 84 individuals) participated in these eight-month-long initiatives. From previous cohort projects, 12 sites have now achieved 50001 Ready recognition.

OUR MISSION

Advanced Energy's mission is to provide economic, environmental and societal benefits through innovative and practical approaches to energy issues.

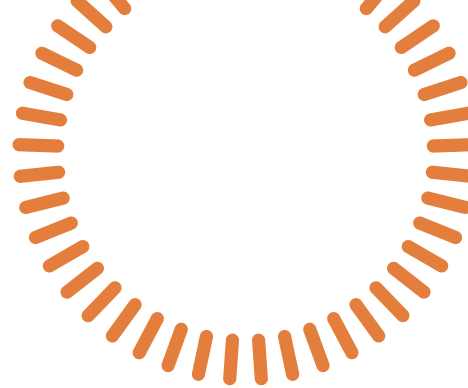
ENERGY ASSESSMENTS BRING BIG SAVINGS

Our energy assessments took us from the mountains to the coast in North Carolina. We supported facilities that work in adhesive tape manufacturing, tire and construction reinforcement and composites, metal packaging, aluminum casting manufacturing, electrical equipment manufacturing, tobacco manufacturing, food distribution and more. In 2022, our most recent year with complete data, the energy conservation measures we recommended would save facilities, annually, more than 37 million kilowatt-hours (kWh), \$3.6 million and 17,600 tons of carbon.

COMMISSIONING DISTRIBUTED ENERGY RESOURCES FOR UNITED THERAPEUTICS

We furthered our nearly decade-long relationship with biotechnology company United Therapeutics, commissioning the company's net-zero-energy operational facility in Research Triangle Park, North Carolina. The 55,000-square-foot building has no diesel, natural gas or propane generators. It generates energy from a 437.5-kilowatt (kW) AC rooftop solar array; two Tesla Megapack batteries, each providing 3.1 megawatt-hours (MWh) and 770 kW of capacity; and a microgrid controller. The on-site generation will be able to match all of the facility's energy needs over a year and provide backup power in the event of an outage.





SUPPORTING NORTH CAROLINA'S LOCAL COMMUNITIES AND GOVERNMENTS

TOWN OF HOLLY SPRINGS

We supported the Town of Holly Springs with EV infrastructure planning at a new operations campus and Cass Holt Road Park. This infrastructure plan will outline the number of charging stations the town should install at the facility when it opens in 2026 and provide clear guidance on the number of future-proofed parking spaces the town should prepare for to support its operational fleet.

TOWN OF CHAPEL HILL & CITY OF DURHAM

For the Town of Chapel Hill, we provided electric vehicle supply equipment (EVSE) make-ready considerations and helped them update their green building requirements. We also provided technical consulting for EVSE services and planning for the City of Durham.

STATEWIDE ASSISTANCE

We assisted the NC Department of Transportation (NCDOT) with stakeholder support through its continued rollout of North Carolina's state plan for the National Electric Vehicle Infrastructure (NEVI) program, which will bring high-powered DC fast chargers to key travel corridors. We also partnered with North Carolina's Electric Cooperatives and NCDOT on a proposal to deploy battery-supported DC fast chargers at two rural locations.



IMPROVING ENERGY EFFICIENCY IN UNDERSERVED COMMUNITIES

HABITAT FOR HUMANITY REMAINS INVALUABLE PARTNER IN SYSTEMVISION

We've worked closely with Habitat for Humanity for years through SystemVision, our — and the nation's only — affordable housing guarantee program. SystemVision has guaranteed more than 6,200 homes to date, and 4,147 of those are from Habitat for Humanity.

Habitat provides essential boots on the ground for SystemVision, building homes to meet the goals of the program and performing field testing to ensure compliance with the standards. Because of our history, Wake County Habitat continued to build homes that maintained SystemVision standards even when appraisal values impacted funding and without the promise of incentives or a guarantee. We look forward to more opportunities with Habitat to improve affordable housing in North Carolina.

In 2023, we also sponsored Habitat for Humanity's Camp Habitat, where affiliate leaders gathered for training in best practices, sharing ideas and making connections.



UNDERSTANDING AND STRENGTHENING EFFICIENCY IN MANUFACTURED HOMES

We furthered a multiyear research study with Duke Energy to explore winter peak demand and energy usage in manufactured homes, with a goal of recommending retrofit measures to reduce electricity bills, improve comfort and ease strain on the grid. We installed metering equipment in participant homes to better understand how they and their heating systems use electricity and what opportunities might be available.



RESEARCHING

EMERGING TECHNOLOGIES FOR ELECTRIC UTILITIES

STUDYING VEHICLE-TO-GRID IN THE FIELD WITH DUKE ENERGY

In collaboration with Duke Energy, we kicked off a multiyear study that is exploring vehicle-to-grid applications with electric school buses. We are organizing and scheduling the strategic discharging of bus batteries to respond to system peak considerations while avoiding disruption to the schools. The effort will assist Duke Energy in understanding the potential benefits of leveraging school bus batteries as grid assets, help schools understand the additional value of their buses for demand or emergency response, and evaluate the technology and equipment capabilities and limitations to facilitate these actions.

TESTING ESSENTIAL RENEWABLES TECHNOLOGIES

We participated in a pilot project with Duke Energy to evaluate the performance of smart inverters and their ability to control reactive power, which is crucial to our grid's ability to handle the addition of more renewable energy. In 2023, we completed or actively worked on five pilot sites and found important lessons learned, particularly around power plant controllers.



SMART THERMOSTAT MARKET ASSESSMENT

We supported Duke Energy in a study of how smart thermostat algorithms are designed to work, whether they perform as designed, and whether there are any unintended consequences of the algorithms or thermostat settings. This information focused on how thermostat manufacturers can inform program considerations and grid operational decisions. With particular attention on winter events, we conducted preliminary analyses to determine what algorithm characteristics could be teased out of existing data and what additional questions could be answered through further analysis or secondary research and interviews with manufacturers.

PREDICTABLE PEAK LOAD HOME CHARACTERISTICS — MODELING INVESTIGATION

For decades, grid operators have been focused on and measured by the successes of energy efficiency (kWh) programs. Recent increases in alternative energy resources (e.g., solar, wind, battery storage), though, are revealing a need for more emphasis on power efficiency (kW) programs. An affordable, reliable and dependable protocol/standard for new and existing homes that enables advanced controls and communications with demand response and non-wires-alternatives grid assets could be valuable. The initial aim of this effort included energy modeling of various market-ready components and control options of new homes to better understand the features and benefits for occupants/program participants and grid operators.

IMPROVING

ELECTRIC MOTOR EFFICIENCY

TEST PROGRAM FOR 2050 PARTNERS

We expanded our work with 2050 Partners Inc., who represent the California investor-owned utilities, to motors controlled by variable frequency drives (VFDs). We are currently working through a test program of various induction motors, exploring the repeatability of standardized testing with VFDs.

We also had an opportunity to lead a panel discussion on motor compliance and testing at the Motor & Drive Systems conference. The session covered recent motor regulation changes in the U.S. along with a case study of test results from a group of newly regulated motors (air-over). We were joined on the panel by representatives from 2050 Partners and Vermont Energy Investment Corporation.

CERTIFICATION BODY PROGRAM EXPANDS

Our Certification Body program for motor efficiency, with accreditation by the ANSI National Accreditation Board and the Standards Council of Canada, expanded in 2023, doubling in size and accrediting motor manufacturers distributing covered products in the U.S. and Canada – certifying 732 unique models. To support our Certification Body services, we launched a website portal, with information in English, French and Spanish, and created a marketing video that highlights our updated offerings.



EASA AND PEV PROGRAMS HELP MOTOR SERVICE CENTERS

Our Proven Efficiency Verification (PEV) program and the Electrical Apparatus Service Association's EASA Accreditation program allowed us to help 39 motor service centers achieve and maintain quality procedures that restore motor efficiency during the repair process. We serve service centers across the U.S. with these accreditation programs, including ones in North Carolina. The service centers in our PEV program rewound 750 motors in 2023.

PROVIDING TESTING FOR INDUSTRY PROGRAMS

We continued to assist a variety of industry programs through testing, including AHRI Certified® Variable Frequency Drives, CSA Group check testing, NEMA Premium™ annual license testing, and WorldWide Electric Corporation annual quality control testing.



SUPPORTING DOE RULEMAKING

We support the development and application of test standards for new motor types that the DOE considers for motor efficiency regulations. This year, DOE set new standards with an effective date of September 29, 2023, and a compliance date of June 1, 2027, that would provide up to \$8.8 billion in consumer operating cost savings and reduce carbon dioxide emissions by nearly 92 million metric tons over 30 years. As a result, and to prepare for the updated motor types now regulated (synchronous and inverter-only motors), we added two additional test methods to our scope of accreditation: IEC 61800-9-2 (2023) and IEC 60034-2-3 (2020). We were the first independent motor lab in the world to be accredited to these standards.

ENSURING

RENEWABLE INTERCONNECTIONS REMAIN SAFE AND RELIABLE

TRANSMISSION IBR INTERCONNECTIONS

We grew our projects in transmission-connected inverter-based resources (IBRs), both with field commissioning and process development. In 2023, we actively worked on 472 megawatts (MW) of transmission IBRs and began to expand our services to support Duke Energy Florida.

DISTRIBUTION PERIODIC INSPECTIONS

On behalf of Duke Energy, we continued to administer a self-inspection program for distribution-connected solar facilities. This program requires self-inspections of facilities every five years to ensure they continue to provide safe, reliable and optimal operation. We are also in preliminary discussions about transmission-connected IBRs that preceded the current commissioning program.



SUPPORTING THE NEXT GENERATION OF ENERGY LEADERS

CELEBRATING 20 YEARS OF NC GREENPOWER

We are honored to celebrate NC GreenPower's impact in North Carolina over the last two decades. This impact has been felt far and wide: by people and organizations who've been able to offset their electricity consumption and emissions; by the thousands of individuals who increased their knowledge of clean energy; by local renewable energy and carbon offset generators, for whom renewable projects had been out of financial reach; by schools and their students, who are benefiting from solar power and STEM curriculum on their campuses; and by the renewable energy landscape more broadly, thanks to the foundation built by the nonprofit.

In 2023, for the first time, NC GreenPower's Solar+ Schools program used donations to cover 100% of the costs for 14 schools to install 20-kW rooftop and ground-mounted solar educational packages. Since beginning to pursue clean energy initiatives in K-12 schools in 2015, NC GreenPower has supported 86 schools in 46 counties, reaching nearly 60,000 students across the state.



In addition to enhancing education, NC GreenPower has used voluntary contributions to help fund the generation of 1.06 million MWh of green power from local solar, wind and landfill projects. Carbon offsets have supported the mitigation of 113,000 metric tons of greenhouse gases through projects in North Carolina, South Carolina and Virginia.

UNIVERSITY SPONSORSHIP PROGRAM

Our University Sponsorship Program sponsors student-led clubs and organizations, offering opportunities for them to gain experience while learning about the energy industry. This year, we furthered our relationships with existing partners and focused on supporting historically Black colleges and universities (HBCUs), including Johnson C. Smith University, Shaw University, Saint Augustine's University, Bennett College and North Carolina A&T State University (NC A&T). We also collaborated with new partners, including the Appalachian Energy Center, E4 Carolinas HBCU Energy Leadership Pathway program and the African American Association of Black Engineers Youth Energy Event.



Through our partnerships, we provided training and career development opportunities by offering tours of our internationally accredited motors and drives lab, presenting at conferences and attending career fairs.

STEPS4GROWTH PRE-APPRENTICESHIP PROGRAM

We are a backbone organization for STEPs4GROWTH, a four-year project funded by the U.S. Department of Commerce Economic Development Administration's Good Jobs Challenge and led by

NC A&T. The program aims to connect clean energy industry partners with qualified apprenticeship candidates.

In 2023, with support from Duke Energy, we aligned with the NC Department of Environmental Quality and Nash Community College to assist with the STEPs4GROWTH Pre-Apprenticeship program. The Pre-Apprenticeship program engages with high school and post-high school aged young people to share the



benefits of and opportunities for working in North Carolina's clean energy and manufacturing sectors. Specifically, we led a lecture series at community colleges in eastern North Carolina about the electric transportation industry.

EDUCATING THE

INDUSTRY, PUBLIC AND STAKEHOLDERS

As we work across our markets, we see the benefits of bringing industries together to share insights and find solutions. This year, we hosted discussions and created space for utilities, businesses and various communities to gather and prepare for our energy future.

SHARING THE BENEFITS OF ELECTRIC TRANSPORTATION ACROSS THE STATE

Through our Plug-in NC program, and leveraging its stakeholder and ambassador network, we had numerous opportunities to educate people about electric transportation. This outreach included developing new resources and blog posts, participating in events for National Drive Electric Week, presenting at annual meetings and other more-targeted gatherings, and helping Duke Energy staff its EV Garage at three Durham Bulls games. The EV Garage is an interactive model of a garage that gives people a look at what it's like to live with and charge an EV.



EXPLORING NORTH CAROLINA'S CLEAN ENERGY TRANSITION

We hosted three new webinars as part of our Exploring North Carolina's Clean Energy Transition program, with topics focused on federal funding, offshore wind energy and electric transportation. The webinars are part of a larger library of resources that have been developed over the years to help stakeholders learn about the move to a cleaner, lower-carbon energy environment. Since 2017, when we launched the program, these resources have been viewed more than 56,000 times.

CONNECTING AT TRAININGS, CONFERENCES AND EVENTS

Through in-person trainings, conference presentations and public gatherings, we reached over 12,000 people at over 100 events to increase knowledge and understanding across our expertise areas.

In addition, we supported and sponsored a number of conferences in 2023, including the North Carolina Affordable Housing Conference, North Carolina State Energy Conference, the EASA Convention, the Cooperative Technologies Conference, the SEEA Southeast Energy Summit, the ElectricCities Connections Summit, Electrify NC, MFGCON and the ACEEE Industry Summer Study.



TOP BLOG POSTS IN 2023

Variable Frequency Drives and Their Importance in Industry

Smart Inverter Pilot Testing Helps Prepare the Future of the Grid

Kitt Butler Receives 2023 ACEEE Champion of Energy Efficiency in Industry Award

North Carolina's Electric Transportation Transition

Backup Power Options



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