

Advanced Energy

2016 Annual Report



Advanced Energy is excited to announce the return of our annual report. The annual report was a staple in our early years, and we think bringing it back (after more than a decade-long hiatus) is important to help document all the work we accomplish each year.

2016 was a very exciting and productive year for us. We completed and continued projects in all of our market sectors (solar, electric transportation, motors and drives, commercial, industrial and residential), formed new relationships and worked to promote energy efficiency through investigative research, testing and evaluation, training and education, consulting and program services.





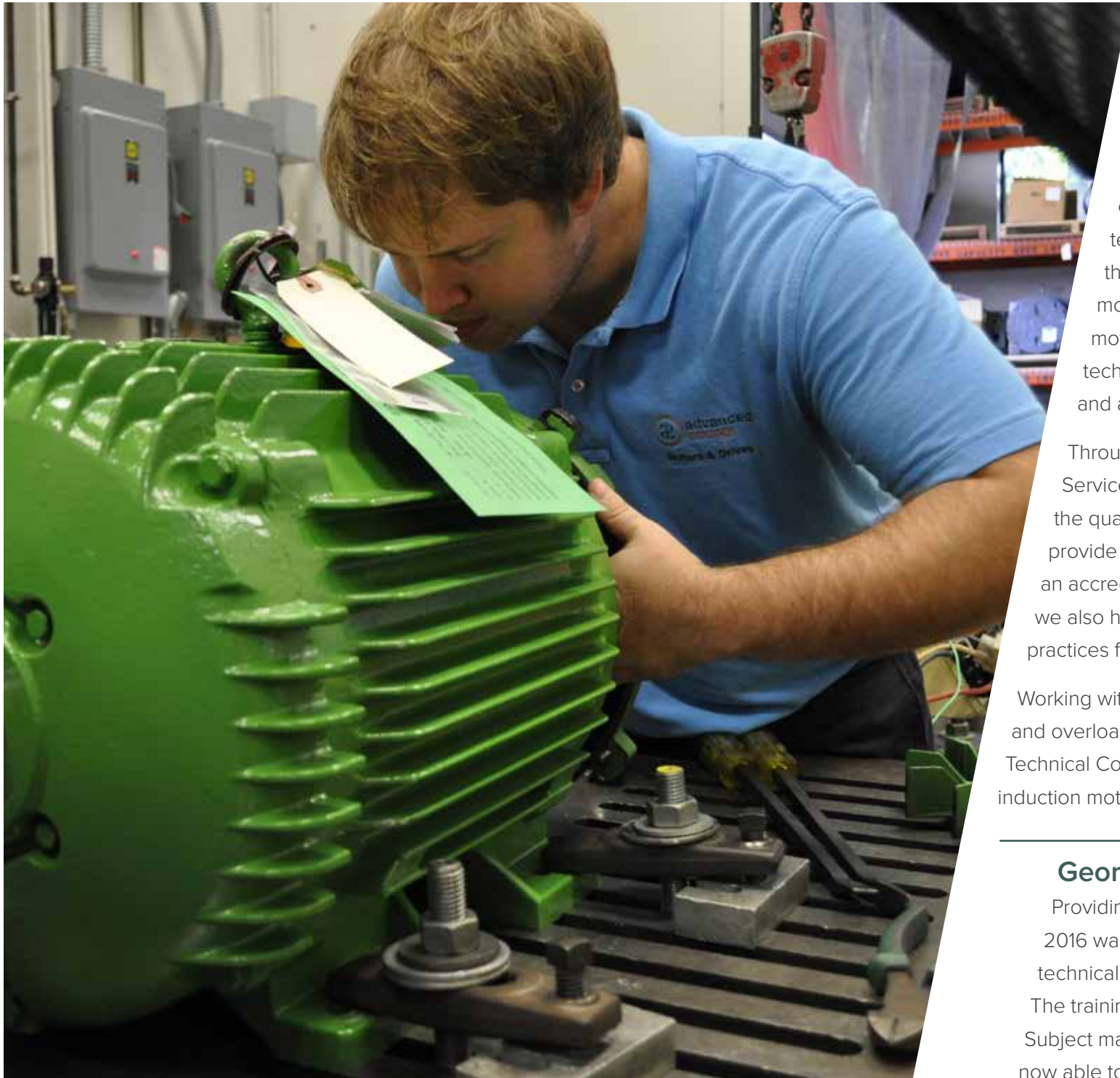
North Carolina Impact

For more than 36 years, we have worked in our home state of North Carolina to improve how energy is used. In 2016, we continued supporting our North Carolina based member utilities (Duke Energy, North Carolina Electric Membership Corporation and Dominion North Carolina Power) in their efforts to use energy efficiently, decrease costs and implement innovative programs. We provided research, testing, consulting, education and program support through a variety of projects within the industrial, commercial, residential, solar, smart grid and electric vehicle markets.

We also continued work within the state's affordable housing market through a partnership with the North Carolina Housing Finance Agency. For nearly two decades, our SystemVision program has been ensuring that homes are healthy, safe, comfortable, durable, energy efficient and affordable for the long-term. This past year we grew our offerings to include a program for existing home retrofits. We are encouraged to see the energy efficiency assistance we provide improve people's lives on a daily basis. Even though we continue to expand our reach nationally and internationally, we always strive to make a positive and lasting impact here at home.

Solar Assessments

With solar on the rise in North Carolina, our solar team continued promoting its services and consulted with many clients and customers to assess and inspect utility-scale photovoltaic (PV) facilities. We partnered with utilities, private owners, developers and more. In one project, we performed interconnection assessments of 25 solar PV facilities owned by a prominent solar developer in an effort to help the company improve its quality process. The assessments evaluated whether the installed inverters, transformers and interconnection equipment agreed with the documentation filed with the utility, determined the inverter and recloser interconnection protection settings, determined whether the transformer vector group and grounding were in compliance with inverter requirements, and identified any other areas of concern with the AC interconnection equipment. We also conducted quality assessments at two of the 25 facilities. The quality assessments included a review of the PV system design and an on-site assessment of the entire PV system to evaluate good design practice and construction quality. Following the interconnection and quality assessments, we delivered a summary report to the solar developer outlining the deficiencies and other PV system quality issues noted.



Electric Motors and Drives Projects

In 2016, our motors and drives team completed a variety of projects for motor manufacturers, original equipment manufacturers (OEMs), the motor repair industry and the U.S. Department of Energy (DOE). We helped motor manufacturers obtain and continue their certifications for selling in the United States and Mexico and concluded another successful year being the only lab worldwide accredited to test to AHRI 1210 for variable frequency drives. In the OEM market, we assessed the performance of a residential water pump so that the manufacturer can offer a more reliable product, and we helped evaluate several materials designed to keep motors cooler while under high loads. We assisted motor designers with testing new technology for switch reluctance, permanent magnet and standard induction motors, and also tested water cooled, blower cooled and even liquid nitrogen cooled machines.

Through our Proven Efficiency Verification (PEV) program and the Electrical Apparatus Service Association's accreditation program, we helped motor service centers improve the quality, reliability and efficiency of the motors they repair. In Ohio, we continued to provide technical support to American Electric Power's EMotor Rewind Program, acting as an accreditation body for participating motor repair centers. To educate motor end users, we also held six motor management workshops across the country that covered motor best practices for maintenance, operation and repair.

Working with Duke Energy's power quality team, our multiyear research on phase monitors and overload protection relays received recognition at IEEE's Pulp, Paper and Forest Industries Technical Conference. We also assisted with evaluating new methods for testing certain induction motors with the DOE, driving future policy on electric motors.

Georgia Power Trainings

Providing trainings and workshops has been a staple of Advanced Energy for decades, and 2016 was no exception. As one example, we worked with Georgia Power to develop two technical trainings for its staff, one on commercial HVAC and the other on motors and drives. The training went through the design development process with a train-the-trainer model. Subject matter experts within Georgia Power co-delivered initial pilot trainings with us and are now able to leverage that experience to continue to grow their staff through internal trainings.



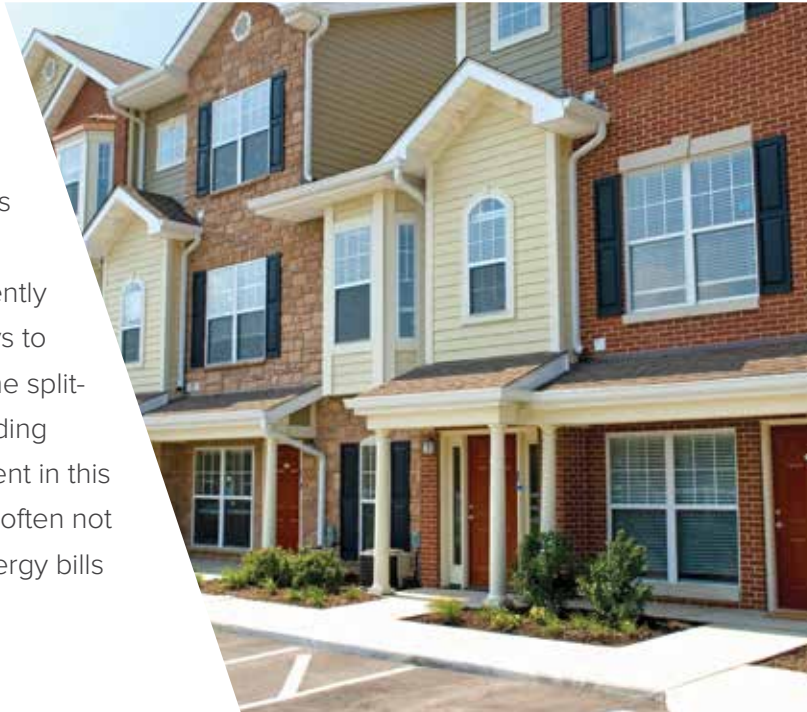
Electric Vehicle Workplace Charging Workshops

Electric transportation is growing in North Carolina and beyond.

In 2016, our transportation team worked on a number of projects to promote electric vehicles across the state. One of these projects was to host a workshop series concentrating on workplace charging. Workshops were held in Asheville, Kernersville and Raleigh, and all had great attendance, attracting employees from local businesses, governments and schools. At the workshops we shared our workplace charging checklist and walked the attendees through the process to plan for and install charging stations.

HVAC Systems for Multi-Tenant Buildings

We researched the energy savings and market potential associated with installing high-efficiency HVAC systems in commercial office and multi-tenant residential buildings. The team is currently continuing this project to examine ways to overcome market barriers, including the split-incentive problem, or the fact that building owners who pay for the initial investment in this type of energy efficiency upgrade are often not the ones benefiting from it on their energy bills (the tenants or occupants are).



Energy Manager on Site

We continued our work of promoting energy efficiency in industrial settings through a mix of assessments, trainings, measurement and verification, and more. In one particular example, we provided energy manager on site (EMOS) services for a large medical testing firm. With EMOS, one of our energy efficiency experts offers customers long-term personalized guidance and help assessing areas of improvement. For this particular customer, we provided key performance benchmarking of facilities and aided with incentives for lighting and HVAC upgrades. On top of that, we conducted lighting assessments and developed financial business cases for approximately 10 of the customer's facilities to initiate lighting projects.



NC GreenPower

In 2016, our NC GreenPower program continued improving the environment with renewable energy, carbon offsets and supporting K-12 schools across North Carolina. Using voluntary contributions, we helped make solar, wind, landfill methane, small hydro, biomass and school solar photovoltaic (PV) projects feasible. The Solar Schools pilot program – which offers funding for small solar PV arrays and curriculum to educate students about renewable energy – completed another successful year and launched its third year in January 2017.

Last year, generous donations provided incentives for nearly 350 local projects. Renewable energy donations funded the generation of 15 million kilowatt-hours of green power from North Carolina solar PV, wind and landfill projects. Carbon offset donations supported 7,000+ tons of greenhouse gas mitigation through landfill methane capture projects. Contributions to the Solar Schools program installed solar PV systems for almost 5,000 students in four counties in our state.



Targeted Technical Assistance for Small Performance Contracting and Measurement and Verification Minimum Requirements Guidelines

With a grant from the U.S. Department of Energy and assistance from the North Carolina Department of Environmental Quality Utility Savings Initiative, we completed a multiyear project assisting K-12 schools, community colleges and local governments with energy performance contracting. Our team provided services such as pre-qualification, helping develop requests for proposal (RFPs), reviewing responses to RFPs and serving as third-party engineers for Investment Grade Audits. As part of the project, we developed and conducted trainings for engineers and energy service performance contractors, as well as created a document containing measurement and verification minimum requirements guidelines.

Cooperative Energy Residential Retrofit Pilot Study

2016 saw the conclusion of the Cooperative Energy (formerly South Mississippi Electric Power Association) Residential Retrofit Pilot Study, a multiyear effort investigating the effects of single-family detached residential retrofits involving duct sealing, attic air sealing and a combination of both. The project consisted of aligning the needs of Cooperative Energy and its 11 member co-ops, recruiting homeowners to participate, finding and training contractors to complete the work, and analyzing the data. A major goal was to ensure a positive homeowner experience through strong communication and customer service. Duct sealing was found to be the most cost-effective measure, but for best results, participant homes should be screened for their duct sealing needs before enrolling in similar retrofit programs. Cooperative Energy is now better prepared to evaluate next steps regarding a full-scale rollout.

Carolinas Energy Planning for the Future

The Carolinas Energy Planning for the Future project concluded at the end of 2016. This undertaking was a collaboration between the South Carolina Energy Office, the North Carolina Department of Environmental Quality, Advanced Energy, and UNC Charlotte's Energy Production and Infrastructure Center. It was launched through a State Energy Program Competitive Award from the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. The project was able to bring together stakeholders from North Carolina and South Carolina to discuss energy issues, facilitate a strong working relationship and prepare for future challenges and opportunities facing the two states. The end result produced a detailed report that examines North Carolina's and South Carolina's energy capacities, infrastructure, regulations, emerging technologies and projections. A local government toolkit was also created consisting of resources and information on a variety of energy topics that impact specific areas of government, including transportation, internal operations, funding and financing, and community programs.

Superior Energy Performance

To further our industrial offerings, Michael Stowe, a senior energy engineer, became one of just seven individuals nationwide to receive certified recognition as a U.S. Department of Energy (DOE) Superior Energy Performance (SEP) Trainer. He has access to all DOE ISO/SEP presentations and instruction materials, and is available to lead ISO/SEP training events for industrial sites or cohorts.



Supporting the Community

We took field work to another level this past fall and volunteered with a Habitat for Humanity project called Build-A-Block in Raleigh. The homes are located close to our main office and provided a great opportunity for staff to learn more about residential building while also aiding our local community. We are going to continue assisting with the project in 2017 and help finish the block of townhouses.



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