About Advanced Energy

Advanced Energy is a nonprofit energy consulting firm. Since 1980, we have been working with electric utilities, government and a wide variety of private organizations in the residential, commercial and industrial, motors and drives, solar and electric vehicle markets.

Over the past few years, we have had the opportunity to get involved in many exciting energy developments to help our clients prepare for and embrace emerging technologies. We have educated end users on smart grid technologies, consulted on utility electric vehicle strategic planning, conducted research projects on new residential heating and cooling options, commissioned utility-scale solar sites, trained account managers on beneficial electrification, became a Certification Body to certify electric motors, and designed energy efficiency pilot programs. We are grateful to be able to support our clients as they navigate this ever-changing industry, and we look forward to the next year with enthusiasm, knowing that we have the tools and expertise to continue to provide valuable services and guidance.

OUR VISION

Advanced Energy’s vision is to ensure that energy is clean, affordable, reliable, efficient and safe for all people.

OUR MISSION

Advanced Energy’s mission is to provide economic, environmental and societal benefits through innovative and practical approaches to energy issues.
Reducing Peak and Improving Efficiency in Homes

There continues to be growing interest, from a number of stakeholders, in solutions to manage peak load, or times when consumer demand for electricity and comfort is at its highest. Air conditioning and space heating in particular are big contributors to peak during the hottest and coldest hours, on top of being significant energy consumers more generally throughout the year. With this in mind, our residential team pursued a number of projects in 2019 — using both computer-generated energy models and field studies — to evaluate technologies that can benefit energy consumers and utilities alike, with an emphasis on managing peak load.

In partnership with the North Carolina Electric Membership Corporation, we further explored coincident peak load impacts of 12 HVAC systems in four North Carolina cities. The study examined energy demand (kW) for each system annually and monthly, energy consumption (kWh) for each system annually and monthly, and average costs to replace each system.

We also invested in learning about hourly and sub-hourly energy modeling, particularly with the nationally recognized, open-source EnergyPlus™ software. The goals were to become more familiar with its functionality and gain a higher level of confidence in its outputs when examining peak load impacts. Eventually, we plan to create templates of two simulated homes that can be cost-effectively applied to a variety of locations.

To supplement our modeling work, we are conducting ongoing field studies of auxiliary-free variable capacity heat pumps in both new and existing homes co-located in Asheville. Unlike traditional heat pumps, this technology does not have to call on auxiliary strip heat in the coldest of temperatures, so it greatly limits spikes in energy demand (kW) while maintaining occupant comfort.

A separate field study evaluated mini-split heat pumps in low-load homes in the Southeast. Low-load homes are designed and built to be highly efficient, but what’s considered “low-load” today will likely be standard in the future, so it is important to evaluate their performance. Participating homes
were fitted with sensors that measured indoor air temperature, relative humidity and energy performance in both kW and kWh. Although there was substantial variability in the temperature and relative humidity data, the mini-splits proved to be very energy efficient.

In addition to our program assistance and technology evaluations, we had numerous opportunities to share our expertise through trainings and trade-ally support. For example, we conducted a combination classroom/field training with North Carolina’s Electric Cooperatives on energy auditing fundamentals, and throughout the year we developed and delivered trainings for Duke Energy’s Find It Duke contractor referral network. Lastly, our award-winning affordable housing program, SystemVision, continues to offer classroom and field trainings across the state for housing developers, home energy raters, contractors and design professionals focused on meeting the program’s high-performance new construction standards.
Supporting Affordable Housing in North Carolina

Together with the North Carolina Housing Finance Agency, we updated to the 2019 SystemVision standards and conducted a webinar and two in-person trainings for our affiliates. Our staggered rollout of the standards is in progress, and they will be fully adopted on January 1, 2020. The updates primarily focus on accessibility of new homes and aging in place, as well as health and safety with minor changes to energy efficiency measures. To date, more than 5,500 homes have received SystemVision certification, with 242 in 2019.

We have also begun using new modeling software that allows us to measure energy consumption in hourly steps, which improves accuracy when awarding our SystemVision comfort and energy guarantees.

Our Supportive Housing Program efforts have once again yielded positive results across North Carolina. A particularly successful project was a new community housing shelter and administrative building in Monroe, North Carolina. The site will serve Union County with a temporary place to stay for eight families and more than 50 individuals at any given time. Nearly entirely operated by volunteers, this location will provide synergistic benefits and volunteer opportunities for years to come.

In addition, our team has been monitoring and attending meetings of the City of Raleigh Affordable Homes 5-Year Planning Process as well as exploring outside groups and initiatives where affordable housing is the prime focus. We aim to continue our role as the technical and programmatic experts within the Southeastern affordable housing market.
Solar PV Interconnection Commissioning

As an increasing number of solar photovoltaic (PV) facilities are being connected in North Carolina, it is important to ensure their quality and dependability to protect the power quality, reliability and safety of the utility grid. In our Interconnection Commissioning program, we review facility as-built construction for compliance with documentation studied and approved by the utility, assess facility AC construction to ensure it is built to quality standards, verify inverter and/or customer recloser interconnection protection setpoints, and conduct three phase and single phase cease to energize testing.

We have been commissioning projects on behalf of Duke Energy for almost three years, and in 2019, we expanded and worked with Randolph Electric Membership Corporation on a similar program.

Solar Periodic Inspections

Because solar PV facilities are expected to operate for decades, it is critical to ensure their continued safety and reliability, and periodic inspections represent one way to make sure facilities remain in compliance. As part of a pilot project in 2018 and 2019, we conducted nine periodic inspections on PV facilities in Duke Energy territory that entered service between 2012 and 2015. We presented the technical results of these inspections to an industry stakeholder group in the fall, and we plan on using the findings and stakeholder feedback to collaborate with Duke Energy on a potential full periodic inspection program.
Supporting Our Environment and Schools with Renewable Energy

In 2019, NC GreenPower – our renewable energy subsidiary – continued to improve our environment by supporting green power, carbon offsets and grants for solar installations at K-12 schools. Voluntary contributions have provided incentives for more than 1,050 local projects since 2003, helping to fund the generation of 999 million kilowatt-hours of green power from North Carolina solar, wind and landfill projects. In addition, carbon offset donations supported 72,000 metric tonnes of greenhouse gas mitigation over the last decade through methane capture projects.

The NC GreenPower Solar Schools program completed another successful year, its fifth. To date, it has provided educational solar installations at 32 schools in 27 counties, bringing solar and energy education to more than 26,000 students in our state.
Electrifying Transportation in North Carolina

2019 brought a lot of exciting developments around electric vehicles in North Carolina, and our statewide program Plug-in NC was once again there to spread the word and educate the community. With the support of our steering committee and other local organizations, we participated in events throughout the year to engage stakeholders about the electric vehicle activities happening across the state, the benefits of electric fleet vehicles and how we can best prepare for the technology’s continued arrival. Furthermore, with the help of our members and ambassadors, North Carolina had its largest National Drive Electric Week showing to date, bringing together electric vehicle owners, advocates and future drivers to promote electric transportation. We even kicked off a campaign to get North Carolina an electric vehicle-focused specialty license plate!

We also supported our member utilities as they revealed big undertakings in electric transportation. Duke Energy proposed to the North Carolina Utilities Commission an electric transportation pilot that would be the largest such initiative in the Southeast to date; the North Carolina Electric Membership Corporation announced a $1 million investment in rural electric vehicle charging infrastructure across the state; and Dominion Energy plans to launch the nation’s largest electric school bus effort, aiming for 1,050 to be deployed by 2025.
Electric Motors and Drives Update

In 2019, our motors and drives team consulted with and tested for utilities, motor and drive manufacturers, original equipment manufacturers (OEMs), the motor repair industry, motor and drive developers and others. We helped motor manufacturers obtain and continue their certifications for meeting efficiency requirements in the United States and Mexico, and we traveled to the latter for the first time to meet our key account, the Asociación de Normalización y Certificación, A.C. (ANCE). We also remain the only lab in the world able to carry out certification testing for the Air-Conditioning, Heating, and Refrigeration Institute certified drive program.

In the OEM market, we assessed the performance of a motor used in submersible pumping applications. The OEM purchases stators from a motor manufacturer and over-sizes the rotor to fit application needs. Excessive heat is an issue, and the OEM was able to quantify design specifications through multiple rounds of testing on our dynamometer. We also helped motor designers improve existing products and evaluate electric motor build quality, efficiency and thermal performance.
In addition, we assisted a motor manufacturer with designing and building its own test bench similar to one of our current AC dynamometers. The client wanted to be able to perform IEEE 112 Method B tests in-house, and it now has that capability.

Through our Proven Efficiency Verification (PEV) program and the Electrical Apparatus Service Association’s EASA Accreditation program, we helped 40 motor service centers achieve and maintain quality procedures that restore motor efficiency during the repair process. We also provided funding to support the follow-up to 2003’s EASA/AEMT Rewind Study that evaluated motors with premium efficiencies. All pre- and post-repair testing was performed in our lab, and the study found that motor efficiency can be maintained during rewind and repair by using established good practices, consistent with the results of the earlier investigation.

Partnering with Duke Energy, we developed training aids to help end users understand the importance of correct motor starting for equipment and utility systems. Additionally, we expanded our multiyear research to assess how the proliferation of grid-connected distributed generation in North Carolina is affecting the utility’s power network.

Advanced Energy Recognized as Certification Body by ANSI

Over the past year, we became recognized by the American National Standards Institute (ANSI) as a Certification Body. The achievement signifies that Advanced Energy meets the requirements outlined in ISO/IEC 17065 for organizations that certify products, processes and services, and we can now certify electric motors and small electric motors for efficiency as designated by the U.S. Department of Energy. Later in 2019, we completed our ANSI 17065 renewal audit.
Industrial Beneficial Electrification

We recognize the role that electrification will play in the future and the benefits it offers our clients and their end users. For nearly three decades, we have invested in learning about new technologies and best practices for a variety of applications, including electric vehicles, agriculture, and commercial and industrial. Back in 1990, we established the Industrial Electrotechnology Laboratory, enabling engineers to evaluate and test electric technologies, such as infrared, microwave, ultraviolet, induction and radio frequency. Since then, we have continued to prioritize beneficial electrification in our industrial services. Through electrification audits, our clients better understand how to improve their facilities to operate more efficiently and save money. In 2019, we also held workshops to educate utility staff on how to identify areas where electrification will be helpful, and we developed handouts to provide information on specific technologies, including infrared, industrial heat pumps, induction heating and electric forklifts.
Commercial and Industrial Assessments

Our commercial and industrial team had another productive year in terms of the number and diversity of its energy efficiency assessments and consultations. We supported customers from a variety of industries, including chicken processing, dairy, yarn production, pipe and foundry, stock car racing, commercial chiller manufacturing and more. In all, we visited more than 40 facilities and recommended energy conservation measures totaling over $2.5 million in North Carolina.

As one example, we completed an electrical measurement and verification study for a company that manufactures molded plastic and rubber products out of reused rubber. The study sought to determine the peak current (amp) and peak power (kW) requirements and total energy (kWh) usage of the site’s process equipment to assist with better utilization of its manufacturing equipment. Along the way, we uncovered an abnormal loading condition on one of the plant’s motors that was critical to its processes. This motor ended up failing a few weeks later, and the facility was prepared to address it.
ISO 50001 Engagement

Over the last few years, we have become a recognized subject matter expert in strategic energy management (SEM) and ISO 50001. In 2019, our commercial and industrial team saw continued interest and growth in these areas as more and more end users, utilities and support agencies requested education and consulting.

One area of particular interest has been the U.S. Department of Energy’s (DOE’s) recently released 50001 Ready Navigator™. This online tool supports the DOE’s 50001 Ready™ program, a self-guided approach for establishing an energy management system and self-attesting to the structure of the ISO 50001 standard. We were even the first organization to partner with the DOE on co-branding our own version of the tool.

Since December 2018, we have delivered four two-day trainings and four webinars on the 50001 Ready Navigator, and we have had the opportunity to engage with both public and private local, regional and national organizations.

We are excited to maintain our 50001 credentials and continue to grow our business in the area of SEM and 50001 consulting. Looking ahead, we hope to lead several SEM cohorts and are currently working toward starting our first North Carolina cohort in 2020.

Smart Grid Webinar Series and Case Studies

Over the past decade, we have worked to educate North Carolinians on smart grid technologies. In 2019, we continued our Exploring North Carolina Smart Grid webinar series to provide government and business stakeholders with a convenient way to learn how the smart grid is changing our state’s future. In partnership with utilities and local organizations, we heard from expert guest speakers and developed case studies that highlight real-world examples of smart grid technologies. This year’s webinar topics included electrifying transportation in North Carolina, smart home technologies and developing North Carolina’s energy workforce. The smart grid project will continue in 2020 with additional webinars and case studies.
Advanced Energy Online

We are constantly looking for new ways to grow our educational reach and share our knowledge and research with others. In 2019, we connected with broader audiences through online efforts by posting educational blog posts on our website, expanding our social media presence and creating new videos that showcase the services offered by each of our markets.

Trainings, Events and Conferences

Through in-person trainings, conference presentations and public gatherings, we reached around 5,500 people at over 80 events to increase knowledge and understanding across all of our markets.

We were also honored to support and sponsor a number of conferences in 2019, including the North Carolina State Energy Conference, EASA Convention, AEE World Energy Conference & Expo, SEEA Annual Conference, ACEEE’s National Conference on Energy Efficiency as a Resource, Solar Power Southeast, North Carolina Affordable Housing Conference, and the Motor & Drive Systems Conference.

All of the conferences provided excellent learning and networking opportunities for our staff.
Supporting our Community

We love supporting our local community, and in 2019, we organized multiple opportunities to give back. Helping out at the Food Bank of Central and Eastern North Carolina, we packaged the equivalent of 5,996 meals. We also collected school supplies for Haven House Services’ yearly back-to-school drive as well as can tabs for the Ronald McDonald House of Durham and Wake. Finally, we hosted our annual campaign to raise money for the United Way of the Greater Triangle to support its programs in youth success, early childhood success and stable homes.