The North Carolina ENERGY EFFICIENCY POTENTIAL Report

Quantifying the energy, economic and environmental benefits available to North Carolina through increased investment in energy efficiency
The North Carolina Energy Efficiency Potential Report provides comprehensive quantitative data to inform policymakers, utilities, industry professionals, consumers and others of the widespread benefits available through an underutilized energy efficiency market in the state. Written by North Carolina Building Performance Association (NCBPA), the report is a compilation of research reports, case studies and new analysis detailing how North Carolina’s energy sector, environment, economy, workforce and consumers would benefit from increased utilization of the state’s already strong, but vastly underutilized, energy efficiency market. The report recommends state and local policy development and related initiatives that collect utility and market data needed to prioritize the policy recommendations. Economic impact estimates resulting from these policy actions follow, focusing on job creation, local economic development and environmental benefits. To conclude, the report recommends new legislation that sets in motion the studies, initiatives and strategies needed to advance the use of energy efficiency in North Carolina.

NCBPA is a 501(c)(6) not-for-profit trade association of building performance professionals and companies leading high-performance construction in the state through workforce development, political advocacy, consumer education, market valuation and member services. The association works with member companies and partner organizations to promote opportunities that improve the quality of buildings in North Carolina so that all residents and businesses can live and work in healthy, safe, durable, cost-effective and environmentally friendly homes and buildings. Visit www.BuildingNC.org for more information.

In 2017, NCBPA published “The Business Case for Energy Efficiency: How Investing in Less Creates More for North Carolina” that outlines a wealth of energy efficiency policy recommendations for the state. For the first time, the many opportunities utilities, advocates and governments have been discussing for years were brought together in a “roadmap” format. Since its release, the report has brought attention to the policies available to North Carolina that would not only save energy, but also improve state and local economies, create jobs and improve the state’s building infrastructure. The North Carolina Energy Policy Council (EPC) affirmed nearly all of the report’s recommendations in its biannual report released in August of 2018. Compared to past policy studies and reports that provided only recommendations, this report quantifies the benefits and energy savings available through increased investment in energy efficiency in the built environment.
EXECUTIVE SUMMARY

“Energy efficiency is not just about saving energy, it’s about tackling economic, environmental and social issues at the same time.”

- HARRY VERHAAR, HEAD OF GLOBAL PUBLIC & GOVERNMENT AFFAIRS FOR PHILIPS LIGHTING

NCBPA offers this data-driven report to North Carolina policymakers, utilities, consumers and industry professionals to encourage their support of state and local policies that prioritize the use of our state’s most cost-effective source of energy available: the energy that is not needed in the first place.

With increased investment in energy efficiency, this report identifies a 331 Trillion BTU 10-year savings opportunity available to the state, totaling $13.9 Billion in energy savings, 53,200 new jobs created and a 0.6% increase in the state’s Gross Domestic Product (GDP).

North Carolina currently lags behind 31 states for energy efficiency policy support, according to the American Council for an Energy-Efficient Economy’s (ACEEE) 2018 report. We believe that our state should do better and know that it can.

NCBPA recommends that North Carolina policymakers enable comprehensive legislation that prioritizes the use of building energy efficiency to address our state’s current and future energy needs. Doing so will reduce energy use, save money, create more resilient buildings and shape a safer and healthier environment.

State-funded reports dating back to 2003 and 2006 identified 6% and 14% electricity savings available, but are now outdated. Even with North Carolina’s significant investment in clean energy generation in the past several years, energy efficiency potential continues to increase.

The past ten years have seen an explosion of clean energy policy investment that have captivated audiences and elevated North Carolina to a remarkable position of having the second most installed solar capacity in the country. Industry stakeholders know that this growth did not come at the utilization of North Carolina’s natural geography, but instead due to massive policy investment.

Unfortunately, energy efficiency’s ability to improve the cost effectiveness of those technologies while at the same time offering a wealth of other benefits has been ignored.

Through our research, NCBPA estimates that:

- A 5% increase in energy efficiency investment will cost $798 Million and offer energy savings of $4.2 Billion.
- A 10% increase will cost $1.6 Billion and offer energy savings of $8.3 Billion.
- A 16.8% increase will cost $2.7 Billion and offer energy savings of $13.9 Billion.

These energy savings would benefit all building types in the state, residential through industrial, new construction and retrofit. Using the 16.8% investment mark, retrofit energy savings projects would benefit:

- Residential buildings by $1.8 Billion.
- Public buildings by $429 Million.
- Commercial and industrial buildings by $1.7 Billion.

In addition, NCBPA estimates a total of $10.0 Billion in energy savings available through new construction energy code improvements.

These energy efficiency investments correlate to massive environmental benefits. A 16.8% increase in energy efficiency would offset 72.9 Million metric tons of CO₂. This is the equivalent of:

- 15.5 Million cars being driven for one year.
- 8.1 Billion gallons of gasoline being consumed.
- 8,286 wind turbines running for a year.
- 85 Million acres of forest being saved from harvest.

To fund these investments, North Carolina should establish policies that reduce cost barriers, lower risks and reduce regulatory compliance costs. These include targeted funding and incentive programs that increase investment in energy efficiency, combined heat and power, and services by residents, industries and businesses in the state.

No matter what investment North Carolina takes, the strategy remains the same: investing in less creates more energy savings, more jobs, more economic development and more environmental benefits for North Carolina.

Clearly, the benefits of increased investment in energy efficiency are too great for our state to ignore any longer.

NCBPA ESTIMATES NORTH CAROLINA CAN REDUCE ENERGY CONSUMPTION BY 16.8% THROUGH ENERGY EFFICIENCY PRODUCTS AND SERVICES.
BENEFITS OF INCREASED INVESTMENT IN ENERGY EFFICIENCY

“We’re never going to get to our carbon targets or energy targets just by ramping up solar production. We need to be efficient and reduce first. A dollar towards efficiency goes a lot farther than a dollar towards production. That’s what we do.”

-DYLAN BUONFRISCO, REDESIGN.BUILD

WHILE THE MAJORITY OF ENERGY DEVELOPMENT IN NORTH CAROLINA FOCUSES ON NEW, CLEAN AND COST-EFFECTIVE FORMS OF PRODUCING MORE ENERGY, INCREASING INVESTMENT IN BUILDING ENERGY EFFICIENCY LOWERS ENERGY DEMAND, CREATES LOCAL JOBS AND MAKES EXISTING ENERGY SOURCES WORK BETTER AND LAST LONGER.

Why energy efficiency? A recent Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) report identified 30.9 million MW hours of potential electricity savings alone in NC for 2016 – 2035, accounting for 18.4% of our state’s energy needs. According to this report, only 8 states have more energy efficiency potential than North Carolina.

Why buildings? Residential and commercial buildings account for roughly 50% of North Carolina’s energy usage, with industrial facilities accounting for an additional 28%. New construction buildings are becoming more energy efficient, but more than 99% of buildings in the state already exist, and the majority are energy inefficient.

Investing in energy efficient buildings is a win for all parties. State and local governments help create jobs and improve public and private spaces, public and private industry put more people to work with steady and lasting jobs, and the environment improves through less reliance on fossil fuels and manufacturing of natural resource-intensive clean energy generation sources like solar panels, wind turbines and battery storage.

Why study the potential? While there is a wealth of data available from the DOE, two outdated state-funded studies, Duke Energy’s annual reports and more, there has yet to be a comprehensive benefits study that brings together the energy, economic development, environment and other benefits that investing in those energy savings products and services would achieve. Energy efficiency offers a wealth of non-energy benefits - including health, safety, worker productivity, long-term job creation and more - that are traditionally not captured in energy and economic reporting.

Increased investment in energy efficiency returns benefits at an exponential rate to people, places and the environment. Building energy efficiency is the easiest and most cost-effective strategy to achieve a significant and lasting reduction in energy demand.

“Just use less in the first place” is an effective strategy that policymakers and consumers can support, but doing so requires a commitment to policy development, consumer education and a top-down strategy from state leaders.
REDUCED ENERGY DEMAND

Using less energy is the simplest, cleanest and most cost-effective method to address North Carolina’s current and future energy needs. In recent years, North Carolina has begun to experience a decoupling of electricity demand and economic growth as the state increases the value of its goods and services produced per energy unit. This increase in energy productivity is a win-win credited, in part, to energy efficiency’s contribution to state and local economic development.

Retail electricity sales to North Carolina consumers in 2016 exceeded 134,000 GWh – its highest level in the last five years – distributed between residential (43%) commercial (36%) and industrial (21%) customers. However, the overall trend since 2010 suggests demand is flattening, even declining in 2017.

NCBPA recommends that North Carolina invest in “energy efficiency as a resource” and consider the “negawatts” or negative energy produced through efficiency as a valued and priority asset in the state’s energy generation portfolio. Doing so will increase energy efficiency’s value when compared to traditional and clean forms of energy generation.

Reducing energy demand creates a more reliable, durable and cost-effective energy infrastructure that doesn’t rely on peak demand needs and, over time, can lessen the development requirements of new sources. Investing in energy efficient homes and buildings as they are constructed new is the best time and most cost-effective means for doing so.

Buildings continue to move towards greater use of electricity over natural gas and other sources whose pricing often fluctuates greatly under market conditions. Since electricity pricing and sourcing – through efficiency or renewables – can be controlled more easily, efficiency, an strategic building electrification have become increasingly popular. Focusing on building energy efficiency is easier than ever and continues to offer the most cost-effective means for reducing energy demand to lower bills and save money.

CONSUMER ENERGY AND MONETARY SAVINGS

Homeowners, renters, business owners, property managers and all other consumer groups that pay energy bills can save money through energy efficiency. For low-income households and small businesses, spending less on their energy bills translates to more money available for other significant needs such as food, healthcare, education, payroll and office expenses.

The state establishes residential and commercial energy codes that set the minimum building requirements, including energy efficiency standards. New construction is the best time to implement energy efficiency measures, so the opportunity to do so through energy code is significant. For North Carolina’s new 2018 residential code, builders will pay roughly $211 - $610 more per home to meet the moderate increase in energy efficiency requirements, but homeowners should be pleased to know that the added $1 to $3 per month cost on their mortgage (the builder’s cost passed on to the consumer) results in $6.70 in lower energy bills through the energy efficiency upgrades.

In 2016, New Hanover County completed a “green” roof restoration that resulted in energy and water savings for the county and a welcoming rooftop outdoor space for employees to use for breaks. The $80,000 cost will be recouped through energy savings from the roof and the addition of lighting sensors, a new HVAC system and new windows.

ENERGY EFFICIENCY BENEFITS

IMPROVED ELECTRIC GRID INTELLIGENCE, RELIABILITY, RESILIENCY AND SECURITY

Energy efficiency should be North Carolina’s first and most cost-effective resource for improving electric grid intelligence, reliability, resiliency and security. Starting with energy efficiency, other efforts including distributed generation, energy storage, microgrids and renewable energy become more cost-effective and reliable themselves.

The use of smart meters enables consumers, utilities and third-parties (with proper approval) to better understand energy usage and make decisions on demand-side energy usage, such as reducing electricity while homes or businesses are not in use. This benefit helps to reduce grid congestion during peak loads.

Demand-side energy efficiency can be three times more cost-effective than other measures performed on the supply or grid side. Increased investment in energy efficiency will continue to keep demand low and help offset the need for expensive, fossil-fuel-intensive power plants that are used to address demand spikes, a costly practice. Supply side energy efficiency can shave peak load instantly, lessening the strain on the grid, while also saving consumers money and reducing carbon emissions.

Advanced energy efficiency devices, appliances and analysis software take efficiency a step further. Much like a single water meter showing increases and decreases in water, a single electric meter works the same. Submeters, smart electric panels and connected devices are used to identify not just the amount of saved energy, but where, when and how. This data improves the value and effectiveness of energy efficiency while supporting a smarter and more efficient electric grid.

IMPROVED RETURN ON INVESTMENT INVOLVING RENEWABLES AND STORAGE

Energy efficiency is generally less expensive per kWh than solar photovoltaics (PV) and other renewable technologies, both for homes and buildings. By decreasing the amount of energy needed, the value of the renewable resource can be stretched further, making it more cost-effective for a consumer (albeit they may pay more per kWh for the system due to a lesser quantity needed).

As an example, a traditional residential rooftop solar PV system may cost $20,000 or 20 cents per kWh. An energy efficiency upgrade could cost $5,000 or 5 cents per kWh. By performing the $5,000 energy efficiency upgrade first, a homeowner could reduce their solar cost to $10,000, resulting in a net savings of $5,000 with added benefits of improved comfort, health, safety, durability and more available.

Pairing energy efficiency with renewable energy was found to achieve 90 percent of emissions reductions required to meet the goals of the 2015 Paris Agreement. With only 20 percent of global energy currently being sourced from renewables, the emissions goal cannot be achieved through renewables alone. Energy efficiency improves the effectiveness of energy sector coupling as well. This practice seeks to efficiently exchange the energy output from one source such as steam from a water heating boiler to the input of another source such as an office heating system.
ENERGY EFFICIENCY BENEFITS

BUILDING AND COMMUNITY RESILIENCY

Nearly all North Carolina homes and buildings rely on a variety of systems and features – heating and air systems, lighting, appliances, etc. – that use electricity. Using less energy correlates with a lesser need for these types of systems – a more energy efficient home requires a smaller HVAC system and a more energy efficient building can use less solar PV to offset its usage. This opportunity holds true for all buildings types, no matter their size or source of energy.

Buildings that require backup power in times of emergencies, such as hospitals or data centers, can improve the efficiency of those systems by reducing the amount of energy they need to produce, potentially saving lives and revenue during days that would result in outages, if not for energy efficiency. Less energy usage promotes community resiliency by lessening the use of fossil fuel sourced electricity, offering improved environmental health and community resiliency. Communities themselves become more resilient with energy efficiency because they can save and invest the money they don’t spend on wasted energy.

CONSUMER NON-ENERGY BENEFITS

Energy efficient homes and buildings provide more than just energy savings. They incorporate a variety of other non-energy benefits as well. They include:

- **Health:** Energy efficient buildings offer improved ventilation, decreased air leakage and improved building materials that reduce the opportunity for mold, allergens, combustion appliances and other unsafe factors to harm occupants.
- **Durability:** Energy efficient buildings are more durable due to their improved construction and ability to prevent water and air intrusion from degrading parts of the building.
- **Value:** Energy efficient buildings are worth more than others due to their improved durability, reduced operating costs, and features that make them more comfortable and cost-effective to live or work within.
- **Comfort and Productivity:** Energy efficient buildings offer improved occupant comfort and productivity by having better lighting, heating and air systems, and other features that allow residents, workers and in the case of businesses, customers, to be more productive.
- **Smart and Connected:** Energy efficient buildings often use intelligent and connected devices that encourage consumer usage while in some cases automating energy using features of a home that can save energy and improve productivity.

STATE AND LOCAL ECONOMIC DEVELOPMENT

North Carolina’s state and local governments will benefit from increased investment in energy efficient construction by helping to lower the costs of business operations for small, medium and large businesses alike through energy efficiency programs, rebates and incentives. Reducing operating costs help companies to stay in business, retain workers, increase compensation for existing workers and hire more workers.

In addition to these private sector benefits, public sector energy efficiency investment reduces the taxpayer-funded energy, water and maintenance costs of public buildings. Doing so puts money back into state and local government programs, offering further support to local citizens and businesses.

ENVIRONMENTAL BENEFITS

Because energy efficient buildings rely on less fossil fuels and renewable energy, they use fewer natural resources to produce the energy they need. One methodology growing in popularity in the construction industry is the use of Passive House principles and certifications, where architects and builders strive to have a home or building use as little energy as possible through advanced design and material usage. These passive methodologies for solar heating, shading and other measures can be incorporated into all types of new construction and retrofits and should begin to make their way into minimum code requirements in the next few years.

Energy efficient buildings themselves emit less carbon than others and, in the case of “green” buildings that are also energy efficient, contribute clean air, further improving their environmental benefits. Traditional sources of energy generation including coal and nuclear power require an abundance of water to operate. Energy efficient buildings lessen the amount of water used for energy generation and on their own oftentimes use less water for their water heating, sinks and toilets, and other sources, further saving energy.

IMPROVED UTILITY ENERGY SAVINGS PROGRAMS

Modern energy efficiency cost-effectiveness protocols reward regulated utilities that provide energy efficiency programs to consumers by incorporating a variety of energy and non-energy benefits. Evaluation, measurement and verification (EM&V) procedures that evaluate the value of specific measures can also be improved to give more credit to the energy and non-energy benefits of energy efficiency programs.

Duke Energy offers a variety of residential, commercial and industrial energy efficiency programs that rely on these cost-effectiveness testing protocols to be offered. Increasing the legitimate energy, economic and environmental value of energy efficiency in an Integrated Resource Plan (IRP) would provide more programs and benefits to consumers.

WORKFORCE DEVELOPMENT

Lowering the costs of business operations for small, medium and large private businesses and public institutions through energy efficiency programs, rebates and incentives will help companies and agencies stay in business, retain workers, increase compensation for existing workers and hire more workers.

Energy efficiency jobs contribute significantly to the state and local economies. North Carolina is home to tens of thousands of workers in the energy efficiency manufacturing space, jobs that are currently not outsourced out of state or country, and many more are for local “boots on the ground” workers that spend their paychecks in local economies.

TECHNOLOGY AND MANUFACTURING INNOVATION

North Carolina’s already strong business and research economy could easily serve as a technology and manufacturing innovation hub for energy efficiency. North Carolina is already home to major energy efficiency manufacturers including Cree, Carrier, ABB and Siemens. Leveraging North Carolina’s technology, business and institutional resources for increased energy efficiency innovation will transition an already strong market into that of a national leader.
THE CURRENT STATE OF ENERGY EFFICIENCY POLICY IN NORTH CAROLINA

“The biggest gains, in terms of decreasing the country’s energy bill, the amount of carbon dioxide we put into the atmosphere, and our dependency on foreign oil, will come from energy efficiency.”

- STEVEN CHU, FORMER U.S. SECRETARY OF ENERGY

NORTH CAROLINA HAS ENABLED JUST TWO SIGNIFICANT ENERGY EFFICIENCY POLICIES IN THE PAST 23 YEARS: PERFORMANCE CONTRACTING AND THE RENEWABLE ENERGY AND ENERGY EFFICIENCY PORTFOLIO STANDARD (REPS).

The American Council for an Energy-Efficient Economy’s (ACEEE) annual State Energy Efficiency Scorecard ranks states on the availability and effectiveness of energy efficiency policies. Through detailed analysis of North Carolina’s regulatory and policy environment for energy efficiency, ACEEE found that North Carolina lags behind 31 states and gave the state a score of 14.5 out 50, with 50 representing the “doing everything possible” case. A lack of appliance energy standards, an antiquated energy code and limited use of Combined Heat and Power (CHP) technology are some of the reasons North Carolina ranks poorly. ACEEE recommends that the state’s government and utilities invest in a variety of energy efficiency programs and practices.

Energy demand has been increasing in North Carolina for many decades but has been slowing for the past few years. In 2015, North Carolina spent $30.8 billion on energy with $5.3 billion originating from the commercial sector and $7.9 billion in the residential sector. Energy efficiency offers a cost-effective means to reduce those bills. By making the built environment more energy efficient through retrofitting buildings, systems and appliances, energy consumption and expenditure would decline. Without the now-expired 25% state and 30% federal tax credits that North Carolina’s solar industry benefited from in recent years, energy efficiency has continued to increase in adoption but could have benefited the state much more through supportive policies over these recent years.

North Carolina’s last tangible improvement to energy efficiency policy occurred in 2007 via legislation authorizing the Renewable Energy and Energy Efficiency Portfolio Standard (REPS), better known as “Senate Bill 3”. This legislation requires all investor-owned utilities to invest in clean energy generation but limits the amount of energy efficiency. In recent years, energy efficiency advocates have sought an increase to the energy efficiency limits or a decoupling of the renewables and efficiency requirements. With the 2020 and 2021 milestones getting closer, a thorough review of how this policy has directed the use of energy efficiency, and how it may be improved, is needed.

The most recent comprehensive clean energy legislation in recent years, 2017’s HB589 “Competitive Energy Solutions for NC”, was widely heralded as comprehensive clean energy legislation supported by many diverse stakeholder groups. Unfortunately, energy efficiency was excluded from this legislation.
ENERGY EFFICIENCY POLICIES

RENEWABLE ENERGY AND ENERGY EFFICIENCY PORTFOLIO STANDARD

Since 2007, the Renewable Energy and Energy Efficiency Portfolio Standard (REPS) has set targets for investor-owned utilities to supply energy from clean energy sources. The standard requires 12.5% by 2021 based on 2020 retail electricity sales and limits the contribution of energy efficiency to 25% of that amount. Duke Energy is the leader in energy efficiency as a percentage of retail sales, with an allowable limit of 3.31% through 2021 and 5.0% thereafter.

Duke Energy completed 2017 at 1.07%, well below the allowable targets in REPS. However, when compared to other Southeastern utilities, Duke Energy is the leader in energy efficiency as a percentage of retail sales. With an allowable limit of 3.31% through 2021 and 5.0% thereafter, there is a tremendous amount of energy efficiency savings remaining in the REPS requirements.

To monitor utility compliance with REPS, utilities release a public Integrated Resource Plan (IRP) for citizens and industry stakeholders to analyze. The IRP incorporates the current trends of energy usage, projected energy sales and proposed renewable energy projects.

NCBPA recommends that the North Carolina Utilities Commission (NCUC), the Public Staff, Duke Energy and other key stakeholders research ways in which Duke Energy can be further incentivized or supported in increasing its energy efficiency contribution through REPS. NCBPA believes that modernizing the regulated utility’s energy efficiency cost-effectiveness testing protocols is the starting point.

STATE INCENTIVES

The Green Business Fund, which expired in 2011, remains one of very few state incentive programs for building energy efficiency to have been offered in the past 23 years. In its last year, the Green Business Fund awarded $37 million in grants for renewable energy and energy efficiency retrofits. The North Carolina Department of Commerce estimated that the grants saved or created 108 jobs and resulted in saving 35.8 billion BTU in energy, which equates to $807,481 in annual savings.

Since 2011, energy efficiency retrofits have become more cost-effective and easier to perform. State incentives for building energy efficiency are valuable drivers for private market growth that result in state and local government benefits.

UTILITY PROGRAMS

Utility energy efficiency programs, rebates and incentives are offered by Duke Energy, in part through regulations and mandates, and at unregulated electric cooperatives and municipalities that choose to offer them. For regulated utilities like Duke Energy, utility energy efficiency cost-effectiveness testing, the rules and formulas that determine cost-effectiveness requirements for programs to be offered, are outdated.

The most recent IRPs of Duke Energy Carolinas and Progress Energy Carolinas estimated that in 2030 each utility will have reduced 4.5% its energy produced through energy efficiency means. Dominion reports a reduction in energy sales of 2% annually by 2030. Cumulatively, annual net utility energy efficiency savings is listed at 4.5%.

The other third of energy consumers in the state are supplied by 103 electric cooperatives or municipal utilities that offer voluntary efficiency programs but lag far behind (as a percentage of their total sales) in savings when compared to the regulated utilities. While cooperatives and municipalities only sell a quarter of the energy that regulated utilities sell, they save less than a tenth of what the regulated utilities save.

ENERGY SAVINGS PERFORMANCE CONTRACTING

North Carolina created the Utility Savings Initiative (USI) in 2002-03 to increase energy and water savings in public buildings, resulting in lower utility bills for state and local governments and public institutions that ultimately result in taxpayer savings and benefits.

USI’s original goal was to reduce energy consumption by 30% in 2015. Since its start, the program has saved over $1.3 billion in avoided utility cost by only investing roughly $60 million in taxpayer funded program costs. Contractors that perform the work have their costs paid for through the energy and water savings themselves, meaning the state is not generally burdened for costs related to the project.

USI has saved taxpayers over $735 million in the past two fiscal cycles. Completed projects have saved money and created employment opportunities in local communities across the state. Since 2003, USI projects have created more than 2,000 jobs and will continue to produce more as new projects are implemented.

With the original 30% reduction goal having been reached in 2015, NCBPA recommends that new goals be established to continue the taxpayer, energy and water savings afforded through this program. NCBPA’s policy recommendations include:

• Increasing the energy and water use reduction goals from the initial targets of 30% and 20% by 2015 to 40% and 30% (respectively) by 2025.

• Updating the benchmark dates related to the savings goals.

• Updating the pertinent language in SB668 for departments and programs related to the State Energy Office, NC Department of Environmental Quality (DEQ) and others.

• Repealing a prior 2017 amendment that changed the annual reporting period to two years, changing it back to one.
ENERGY CODE DEVELOPMENT AND IMPLEMENTATION

Building and energy codes set the minimum standards for how energy efficient homes and buildings may be constructed in the state, with a primary focus on new construction. In the past several code development cycles, North Carolina has continued a trend of deviation from the International Code Council (ICC) that establishes versions of energy, water, electrical and other codes for states and local jurisdictions to follow. In North Carolina, these reference codes are seldom used. More stringent energy codes and enforcement would reduce energy waste and emissions while also increasing the lifecycle cost and reliability of residential and commercial buildings.

Energy code development is led by the NC Building Code Council (NCBCC) and implemented and overseen by the NC Department of Insurance (NCDOI). In 2016 and 2017, an Energy Ad Hoc Committee comprised of NCBCC representatives, NCDOI staff and industry stakeholders was tasked with developing the state’s new 2018 residential and commercial energy codes. NCBPA participated in the development process and sought to increase the state’s current base codes from roughly the 2009 version of the International Energy Conservation Code (IECC) to the 2015 version, which would be recognized as North Carolina’s 2018 state code.

Since 2010, the IECC and ASHRAE 90.9 have been updated two times. IECC released codes in 2012 and 2015 and continues to finalize its 2018 code. ASHRAE 90.9 was updated in 2013 and 2016 and also continues to finalize its next version of code requirements.

As of July 1st, 2018, North Carolina’s new 2018 building and energy codes are available for use, ahead of the January 1st, 2019 requirement for new building permits. The new code remains very similar to its predecessor with only minor improvements to energy efficiency. The most significant changes of the new code involve the addition of the Energy Rating Index (ERI) as an energy code compliance option in the residential code and the loss of COMCheck as a compliance option in the state’s base commercial code. REScheck was also lost in the residential code due to significant variation from the ICC standards, though both can be used for buildings that target the 2015 IECC codes.

The minimal increases to energy efficiency standards will be in place for the next three years for commercial and six years for residential. With these code cycles, North Carolina’s code equivalent of the 2012 IECC will be in place through 2021 and 2024, respectively. In most cases, changes to the energy code are proposed by advocate organizations like NCBPA, discussed at the NCBCC and approved if cost-effective and desirable.

During the short legislative session of 2018 at nearly the last-minute, bill language to remove energy efficiency requirements from residential garages was added to an unrelated regulatory reform bill, passed by the legislature and signed into law by the Governor. NCBPA is greatly concerned about this code change process for two reasons:

- The bill removes energy efficiency requirements that, in addition to lowering the utility bills of homeowners and renters, also help ensure the health and safety of occupants from toxic gases and chemicals often found in garages.
- The legislative code change process entirely circumvented the NCBCC’s code change process, which provides for proper review, public comment and studies to be performed.

As a result of this concerning issue, NCBPA recommends legislation that prevents legislative action that circumvents the NCBCC, particularly in cases like this one where health and safety issues are present.

INCREASING NORTH CAROLINA’S MINIMUM RESIDENTIAL ENERGY CODE TO THE 2015 IECC STANDARD WOULD ADD $3 PER MONTH IN ENERGY SAVINGS WHILE COSTING $1 OR LESS TO A MONTHLY MORTGAGE PAYMENT.

ENERGY EFFICIENCY POLICIES

RETROFITTING THE BUILT ENVIRONMENT

A large percentage of North Carolina’s existing homes and buildings are energy inefficient and well-suited for shallow energy retrofits. In many cases, though unknown just how many, homes and buildings are not up to current code standards, are not outfitted with efficient systems and lack high-performing materials that contribute to energy savings.

On the residential side, homeowners often lack the education and motivation to know and act on the energy and monetary savings possible from making cost-effective changes to their homes.

For example, 13.5% of North Carolina’s population lives in manufactured homes. 65% of these homes were built between 1979 and 1999, making them significantly outdated when compared to new building codes and energy efficiency standards. Moreover, this population often lacks the financial means for energy saving improvements.

Multifamily tenants frequently face the split-incentive dilemma. Research has found that landlords are less likely to complete energy efficiency upgrades to rental properties when tenants pay for the utility bill themselves. In these cases, landlords need a clear benefit unrelated to their tenants’ utility bills to invest in energy upgrades.

Commercial buildings represent 22.8% of energy consumption in North Carolina and many are well-suited for energy efficiency retrofits. Over 62% of commercial buildings in the United States were built before 1999, thus lacking the efficient and safe technology and materials that are applied to commercial buildings now.

North Carolina’s downtowns represent the previous statistic, as many streets are lined with historic buildings that are energy inefficient. Office parks and malls built before updated building codes lack necessary efficiency measures. One of the world’s most extensive office parks, Research Triangle Park (RTP), located in the heart of North Carolina, was founded in 1959. Much of the 22.5 million square feet of built space at RTP could benefit from more energy efficient practices that are common in newer commercial buildings.

The EPA, which has offices in the park, found that on average, commercial buildings waste 30% of the energy they consume. Unfortunately, only 2.2% of commercial buildings are retrofitted a year in the United States, leaving North Carolina with much room for improvement.

Industrial buildings are inefficient in many of the same ways as commercial buildings, and like other building owners and operators, industrial firms often lack the right motivation to take on energy saving retrofits and upgrades. In many industrial facilities, the need for a fast return on investment and a lack of time available to implement changes prevent projects from getting off the ground.

The Electric Power Research Institute (EPI) visited 49 industrial plants over the course of three years and in 2015 released a report identifying energy efficiency recommendations for each plant. The report included 734 different recommendations to all 49 plants. Since the release, 61.7% of all the suggestions have been implemented leaving over 90% more to be done in these 49 plants, and much more to be done in the industrial plants all over North Carolina.

WORKFORCE DEVELOPMENT

With more than 50,000 workers in North Carolina, energy efficiency is the largest employment sector of the state’s energy industry, doubling the workforce of all clean energy sectors combined.

For example, 13.5% of North Carolina’s population lives in manufactured homes. 65% of these homes were built between 1979 and 1999, making them significantly outdated when compared to new building codes and energy efficiency standards. Moreover, this population often lacks the financial means for energy saving improvements.

National energy jobs reports identify over 80,000 jobs while state, regional and national studies range from 20,000 to nearly 50,000. For the purposes of this study, NCBPA used E4TheFuture’s 2016 job numbers that include workers in energy efficient HVAC, advanced materials and insulation, efficient lighting, ENERGY STAR appliances and other energy efficiency trades.

North Carolina’s energy efficiency sector is estimated to increase by around 8% annually for the next several years. With this growth comes difficulty in hiring qualified candidates due to a national shortage of skilled labor positions that North Carolina is experiencing firsthand.

With roughly 80% of North Carolina’s clean energy sector goods and services remaining in-state, keeping the energy efficiency workforce moving forward is beneficial to state and local governments and communities.
“Energy innovation is proving itself as the important driver of economic growth in America, producing 14% of the new jobs in 2016.”
- U.S. DEPARTMENT OF ENERGY
A 5% REDUCTION IN ENERGY WOULD:

- Save 99 Trillion BTU of energy statewide
- Save homeowners and renters $538 Million
- Allow for $508 Million in savings to commercial and industrial buildings to be invested in their people, businesses and local economies
- Save taxpayers $129 Million through public building retrofits
- Save $3.0 Billion through building and energy code savings alone

THE INVESTMENT REQUIRED TO ACHIEVE THESE BENEFITS INCLUDES:

- $798 Million in state and local government, utility and consumer funding
- $4.2 Billion in energy savings
- The net result is a $3.4 Billion contribution to North Carolina's economy
THESE ENERGY SAVINGS WOULD BENEFIT NORTH CAROLINA’S ECONOMY BY:

• Creating 15,960 jobs, a 33% increase
• Increasing tax revenue by $750 Million to $15.8 Billion
• Creating the need for 80 new local businesses or growth opportunities for current businesses

THESE ENERGY SAVINGS WOULD BENEFIT THE ENVIRONMENT IN THE AMOUNT OF:

• 21.9 Million tons of CO₂
• 4.6 Million cars being driven for one year
• 2.4 Billion gallons of gasoline being consumed
• 5,486 wind turbines running for one year
• 26 Million acres of forest being saved from harvest
A 10% REDUCTION IN ENERGY WOULD:

- Save 199 Trillion BTU of energy statewide
- Save homeowners and renters $1.1 Billion
- Allow for $1.0 Billion in savings to commercial and industrial buildings to be invested in their people, businesses and local economies
- Save taxpayers $257 Million through public building retrofits
- Save $6.0 Billion through building and energy code savings alone

THE INVESTMENT REQUIRED TO ACHIEVE THESE BENEFITS INCLUDES:

- $1.6 Billion in state and local government, utility and consumer funding
- $8.3 Billion in energy savings
- The net result is a $6.7 Billion contribution to North Carolina’s economy
• Creating 13,920 jobs, a 67% increase
• Increasing tax revenue by $1.5 Billion to $16.5 Billion
• Creating the need for 150 new local businesses or growth opportunities for current businesses
• Reinvesting $6.7 Billion into local economies

• 43.7 Million tons of CO$_2$
• 9.3 Million cars being driven for one year
• 4.9 Billion gallons of gasoline being consumed
• 10,972 wind turbines running for one year
• 51 Million acres of forest being saved from harvest
A 16.8% REDUCTION IN ENERGY WOULD:

- Save 331 Trillion BTU of energy statewide
- Save homeowners and renters $1.8 Billion
- Allow for $1.7 Billion in savings to commercial and industrial buildings to be invested in their people, businesses and local economies
- Save taxpayers $420 Million through public building retrofits
- Save $10.0 Billion through building and energy code savings alone

THE INVESTMENT REQUIRED TO ACHIEVE THESE BENEFITS INCLUDES:

- $2.7 Billion in state and local government, utility and consumer funding
- $13.9 Billion in energy savings
- The net result is a $11.2 Billion contribution to North Carolina’s economy
These energy savings would benefit North Carolina’s economy by:

- Creating 53,200 jobs, a 110% increase
- Increasing tax revenue by $2.5 Billion to $17.5 Billion
- Creating the need for 250 new local businesses or growth opportunities for current businesses
- Reinvesting $11.2 Billion into local economies

These energy savings would benefit the environment in the amount of:

- 72.9 Million tons of CO₂
- 15.5 Million cars being driven for one year
- 8.1 Billion gallons of gasoline being consumed
- 18,286 wind turbines running for one year
- 85 Million acres of forest being saved from harvest
RESIDENTIAL BUILDINGS

North Carolina’s residential sector uses almost two-thirds of its energy on space heating, air conditioning and water heating, all of which can be significantly reduced through energy efficiency improvements.

Single Family Homes

ResStock has completed ample research concerning the cost-effectiveness and savings that result from retrofitting single-family homes. ResStock found that the top ten retrofits and analyzed their effects in single-family homes. All the retrofits reduced the energy needed for space heating, air conditioning and water heating. ResStock determined the percent of the housing stock where the energy efficient upgrades could be applied, and then the percentage of homes where such retrofits would be of cost-effective. On average, retrofits were cost-effective in at least 30% of applicable homes and most of the residential improvements pay for themselves in ten years. If the retrofits were applied to all the cost-effective homes, then the retrofits could generate $1.73 billion annually statewide and 92 trillion Btu in energy savings yearly.

Multifamily Homes

The majority of North Carolina multifamily homes are low-income housing or rentals. If North Carolina developed multifamily-specific programs like Duke Energy’s Helping Home Fund for low-income homes, enabled on-bill financing, or created a program that directly addresses the owner/tenant split incentive issue, North Carolina could produce and retrofit many more energy efficient multifamily homes.

In 2009, the Benningfield Group Inc. prepared an assessment on the US Multifamily Energy Efficiency Potential by 2020 for the Energy Foundation. The Benningfield Group found that most of the multifamily homes in the United States are cost-effective for energy retrofits, making the majority of residences outdated in terms of code and energy efficiency technology. The report, US Multifamily Energy Efficiency Potential, did not assess the energy efficiency potential of North Carolina directly.

NCBPA was able to estimate the energy efficiency potential using the US Multifamily report’s regional estimates and census data. Data allowed NCBPA to find that if the cost-effective portion of North Carolina’s 584,166 multifamily units were retrofitted with government and building owners’ assistance, then North Carolina could save over 2.8 trillion Btu of energy or around 1.4 tons of CO₂ emission, annually. Thus, saving almost $63 million annually.

However, commercial buildings like restaurants, office buildings and retail stores often lack the capital to fund upfront costs or lack the building ownership/authority to make energy efficiency upgrades. On-bill financing and Property Assessed Clean Energy Loans (PACE) allow commercial businesses to finance retrofits to fit their needs. Currently, North Carolina has yet to enable Commercial PACE (C-PACE) and On-bill financing is limited. On-bill financing is offered through a utility and acts as a loan that is paid back through the energy bill. However, utilities are less likely to fund more substantial retrofits when the rate of return is slow.

C-PACE is a strong alternative financing option for commercial renovations that works by financing retrofit projects through privately-financed property tax assessments. The program is not yet available in North Carolina due to regulatory hurdles. The financing is repaid over 20 years through the property tax bill as a lien, which can be split across tenants and passed on to future building owners. In the sixteen states that have active C-PACE programs, there have been $647 million invested in 1,575 projects that have resulted in almost 100,000 jobs being created. The majority of these projects are focused on building energy efficiency in offices, mixed-use buildings, retail, healthcare and hospitality buildings.

COMMERCIAL BUILDINGS

As stated previously, the EPA found that on average commercial buildings waste 30% of the energy they consume. The U.S. commercial sector used around 587 billion BTU and spent upwards of $5.3 billion on energy in 2015, meaning 176.1 billion BTU and $1.6 billion was wasted a year.

To save on energy bills, firms must invest in energy efficiency measures. The Best Value for America’s Energy Dollar: A National Review of the Cost Utility Energy Efficiency Programs report estimates that $1.027 of investment is required to save 1 kWh of energy in commercial buildings. Therefore, $1.39 billion of investment is needed from the commercial sector to save 5.16 billion annually. The return on investment is timely and the benefits vast.

INDUSTRIAL BUILDINGS

Two studies on energy efficiency in the industrial and manufacturing sectors have yielded promising results.

Through a partnership funded by the DOE, NC State and the Industrial Assessment Center trained 92 students to conduct “free energy, productivity and waste assessments for small to medium-sized industrial facilities.” The program works by facilities applying for assessments. Since established, over 600 evaluations have been conducted and 4,886 recommendations have been made. If all recommendations were integrated into industrial facilities, the North Carolina IAC estimates that all proposals could total 9.53 Trillion Btu in energy savings and more than $101 million in cost savings. The IAC’s energy estimates could expand if the assessments were to include large industrial facilities and if evaluations were opt-out instead of an application process.

The American Council for an Energy-Efficient Economy (ACEEE) released a report in 2014 detailing the energy savings of smart manufacturing. Using sensor, systems, processors, and controls smart manufacturing gathers data and can monitor all aspects of the manufacturing process. Monitoring allows the manufacturing facility to optimize the system’s productivity, thus running more efficiently and saving energy. Smart manufacturing would require capital investment for sensors and data devices, but ACEEE estimates that companies would see a 20% reduction in energy intensity in their facilities.

ENERGY EFFICIENCY POTENTIAL

COMMERCIAL ENERGY CONSUMPTION

- Space heating
- Cooling
- Electricity
- Ventilation
- Water heating
- Refrigeration
- Office equipment

ENERGY EFFICIENCY POTENTIAL

INDUSTRIAL BUILDINGS

ENERGY EFFICIENCY POTENTIAL

COMMERCIAL BUILDINGS

ENERGY EFFICIENCY POTENTIAL

RESIDENTIAL BUILDINGS
ENERGY SAVINGS AND OTHER BENEFITS THROUGH CODE

Residential Buildings

Pacific Northwest National Laboratory released a report detailing the residential cost and savings if North Carolina were to transition to the IECC 2015 building code from the current North Carolina Energy Conservation Code of 2012. If North Carolina updated its building code to be more in line with the updated IECC 2015, residential consumers would benefit through greater increases in energy savings and lowered energy bills.

The report found that the would-be IECC 2015 in North Carolina would cost builders an additional $73.92 upfront that would likely add $40.84 to the homeowner's annual mortgage cost. The code would be cost-effective and the annual savings were estimated at $157.20, generating $42.44 in savings in the first year and $116.36 in savings for the years following.

Factoring in Census estimates for new home construction, the savings could total $75.6 million and 52.3 Billion Btu if the IECC 2015 were put in place. This estimate does not include renovations or additions.

Commercial Buildings

On the commercial side, the code could be updated to the current ASHRAE or IECC for commercial buildings. As stated before, North Carolina's current commercial codes aligns with ASHRAE 90.9 2010.

NCBPA was able to estimate the monetary and energy savings that result from code changes using Pacific Northwest National Laboratory reports. The table below details the percentage of energy and cost savings that result from different code changes. The best option for North Carolina would be to transition from ASHRAE 90.9 2010 to 2016. On average, commercial buildings could save 18.45% of their energy expenditure and 14.36% of their energy usage.

If all new commercial buildings were up-to-date with the ASHRAE 90.9 2016 code, then the sector could save $9.8 million and 84,289 billion Btu, allowing businesses to invest their money elsewhere. Alternately, the adoption of a less stringent energy code like IECC 2015 would present an energy expenditure savings of only 3.77% and energy usage savings of 4%.

Energy Code Compliance

Updating energy code is only one step to the process. North Carolina’s state government and local municipalities - who are responsible for enforcing the code - must ensure that energy code is complied with to see the full results.

Researchers have found that in many states only a portion of the built environment meets code, due to other codes relieving buildings from complying with energy codes or lack of enforcement. In 2013, the Institute for Market Transformation conducted an Assessment of Energy Efficiency Achievable from Improved Compliance with US Building Energy Code. The report estimated the monetary and energy savings that would occur if North Carolina moved from both, 75% and 25% compliance to 100% code compliance.

According to the report, if we assume that 25% of North Carolina’s built environment complies with code, then moving to 100% compliance would save $6,881,043 in the first year and $133,899,800 in the tenth year. These saving would decrease the overall residential and commercial energy consumption by .47% in the tenth year alone.

If North Carolina boasts a higher baseline code compliance rate and 75% of North Carolina’s built environment complies with code, then moving to 100% compliance would still save $2.3 million in the first year and $44.6 million in the tenth year.

NCBPA was able to estimate that these savings would decrease the overall residential and commercial energy expenditures by .34% in the tenth year alone. Furthermore, compliance would save 101 billion Btu in the first year and 1.98 trillion Btu in the tenth year. These savings would decrease the overall residential and commercial energy consumption by .16% in the tenth year alone.
PUBLIC BUILDINGS

Energy and property costs are steadily increasing across many of North Carolina’s metro areas where public and institutional buildings are prevalent. The state’s Utility Saving Initiative (USI) is a program that can help combat these issues in public buildings.

Public building energy and water retrofits performed through USI have saved state and local governments and taxpayers $1.3 billion since 2003 and could save much more if the state increased its savings goals, which were achieved in 2015.

New goals of 40% energy savings and 30% water savings by 2030 could present a linear trend of annual avoided cost, which represents the amount of money North Carolina would have spent if the public building still used energy at the same intensity as in the baseline year of 2002-2003.

The Department of Environmental Quality released data on USI in 2017 detailing the percent of change in public agency square footage and energy cost since 2002-2003 and quantitative data on energy usage. Using data from the baseline year and present day, NCBPA predicted future success for the program, with the new goals in place.

If North Carolina’s energy prices and agency space continued to grow at the same rate, then by 2030-2031 we can expect to see 180% more public agency and UNC system space and a 120% increase in energy cost since 2002-2003. With an improved 45% goal by 2030-2031, community colleges would save over $411 million and 14.8 trillion Btu on utilities in 2030-2031 fiscal year alone. The combined avoided cost from public agencies and UNC institutions from 2002 to 2031 would be around $5.47 billion, saving the state and taxpayers much money and creating new contracts for energy efficiency jobs.

Presently, community colleges have only reached a 17% reduction in energy use but have still avoided $41.8 million in energy costs. If trends were to continue and community colleges reached the mandated USI goal of 30% by 2030-2031, community colleges would save over $18 million and 857 billion Btu in 2030 alone.

Under the right regulatory structure, the net utility savings goals present a cost-effective means for utilities to decrease net production. Through the current REPS goals, regulated utilities may save 6,625 GWhs annually by 2030. Under NCBPA’s recommended goals, utilities could save 9,120 GWhs by 2030. However, the cost savings cannot be calculated without the avoided cost data, which is released privately and is redacted on the public IRPs. A more comprehensive analysis with the right data is needed. It is important to note that NCBPA’s projections do not include the 103 non-regulated utilities due to a lack of available data.
JOB CREATION

Using energy efficiency job estimates from E4TheFuture’s 2016 jobs report and other market data, NCBPA was able to estimate the sector’s job growth for the coming years.

If North Carolina were to reach this report’s energy efficiency potential estimate of 16.8% over the next ten years, NCBPA estimates that 53,200 jobs would be created. These jobs would blend traditional construction careers with those of clean energy. The roles would include auditing and retrofitting existing buildings and working to ensure that new buildings are energy efficient through code requirements and voluntary programs.

Using the data gathered on energy savings and cost savings, NCBPA was able to estimate the amount of capital investment needed to reach the savings. NCBPA used methodology from The Best Value for America’s Energy Dollar: A National Review of the Cost Utility Energy Efficiency Programs report to determine the cost of saved energy and ACEEE’s Job Analysis Fact Sheet to estimate the number of jobs created.

The Best Value for America’s Energy Dollar report found that one kWh of saved energy required $0.027 of investment and long-term savings would affect job creation.

Based on North Carolina’s net energy use reduction of 16.8% and an investment of $2.66 billion, NCBPA found that energy efficiency investment would create 53,200 jobs, 7,980 more jobs than investment in other areas. The investment and savings from energy efficiency reduction estimated to affect almost 98,000 jobs per year. The affected jobs could come from construction, logistics, finance, hospitality, research and other areas.

PROJECTED ENERGY EFFICIENCY JOB GROWTH IN NORTH CAROLINA BY TYPE OF JOB

In this estimate, jobs are defined by direct energy efficiency jobs, indirect or supporting energy efficiency industry jobs, and induced jobs, or non-energy efficiency jobs, acquired from more savings and reinvestment into North Carolina.

ENVIROMENTAL BENEFITS

Energy reduction through efficiency is important environmentally as any lessened reliance on fossil fuels like natural gas and coal that produce carbon, nitrous oxides, methane and other greenhouse gases support a cleaner, healthier and more resilient environment.

Reductions in greenhouse gases would have tremendous benefits for the health and safety of North Carolina’s citizens, as well. Emissions have been proven to cause a decline in air quality and health issues that exacerbate respiratory, cardiovascular and heat-related conditions. Harmful emissions also degrade growing conditions for farmers by threatening water sources and harming vital ecosystems.

Reducing emissions through energy efficiency is a cost-effective way to combat endangering citizens and damaging the environment. Fossil fuel energy production also uses an extreme amount of water. Reducing North Carolina’s reliance on fossil fuels helps to reduce the amount of harmful toxins emitted and the amount of clean water being wasted through energy generation.

Using an EPA analysis tool, NCBPA assessed the avoided carbon dioxide emissions that a 16.8% reduction in energy usage would provide. That amount of energy savings equates to roughly 31.11 trillion Btu and over 72 million metric tons of carbon dioxide annually. 72 million metric tons of carbon dioxide is equal to almost 15.5 million cars driven in a year or over 8.1 billion gallons of gasoline being consumed. Energy efficiency at this scale would be equivalent to the avoided carbon dioxide of 18,286 wind turbines.

This amount of turbines would require an investment of more than $36.5 billion, assuming turbines cost around $2 million each.

An investment of $2.6 billion in energy efficiency has the same environmental benefits as the $36.5 billion investment in turbines. These estimates are solely carbon dioxide offsets. Estimates including other avoided gases and water usage would further improve energy efficiency’s value.

“First and foremost, energy efficiency is a major lever for reducing CO₂ emissions along all parts of the energy chain - from the production of resources all the way to final consumption.”

-JOE KAESER, CEO OF SIEMENS
CASE STUDIES

NORTH CAROLINA CASE STUDIES

108 AND 110 SOUTH MAIN ST, WARRENTON
Rebuilding Downtowns

Energy efficiency is a great way to promote economic development and rebuild old downtowns. Building energy efficiency retrofits improve the health, safety, durability, comfort and occupancy of older buildings while reducing their operating costs. In efforts to revitalize Warrenton, the county’s economic development board used the Green Business Fund to retrofit 108 & 110 South Main St with LED lighting, HVAC and more efficient insulation. Now, the buildings save over 23,600 kWh annually and are home to new residents and businesses.

STATE STREET APARTMENTS, RALEIGH
Reduced Utility Bills for Low-Income Tenants

Affordable housing developments include some of the least efficient buildings in North Carolina. Builders of Hope, a nonprofit, focuses on creating safer, cleaner, healthier and more energy efficient housing for low-income populations. The nonprofit used the Green Business Fund to renovate the 1920’s State Street apartments in Raleigh with improved air sealing and insulation. The renovation helps save each household around $317 a year and generates savings of more than 127,000 kWh a year.

CHARLOTTE EAST OFFICE PARK, CHARLOTTE
More Efficient Office Parks

Charlotte East Office Park was built in 1970 and after many years of operating was in need of energy efficiency retrofits to reduce costs and improve occupancy. The buildings’ owners upgraded to indoor and outdoor LED lighting to yield annual savings of $26,000 and more than 439,000 kWh.
ST. CLAIR INN, MICHIGAN
C-PACE in Hospitality

Lean & Green Michigan recently financed the renovation of the historic St. Clair Inn using the state’s largest C-PACE financing project to date. Needing to cut costs and restore the historical landmark, the hotel’s owners used C-PACE to upgrade the building’s insulation, lighting, HVAC systems and appliances to modern energy saving standards. The project is estimated to save $1.95 million in 20 years.

BUTLER BROTHERS BUILDING, TEXAS
C-PACE in Mixed Use Space

This historic warehouse in Dallas was abandoned and in disrepair until CleanFund, a C-PACE financier, redeveloped the building. The energy efficiency retrofits made the building 40% more efficient than before, making it more attractive to potential renters. In addition to making the building more efficient, the retrofit also converted the warehouse space into a more useable mixed-use space, creating 100 jobs along the way.

860 POTOMAC, COLORADO
C-PACE in Medical Building

860 Potomac was an old medical office experiencing a steady decline in tenants as newer buildings were constructed around the medical campus. Using C-PACE, Calmwater Capital was able to upgrade the building’s HVAC system and install controls that reduced the cost of operation and maintenance by 40%. These improvements saved the owners energy and money allowing them to lower rent prices to retain existing tenants and attract new ones.

“The road to energy efficiency is, in theory, a sustainability sweepstake. More efficiency means less fuel is required to generate a given amount of energy, which in turn means lower costs for the provider and cheaper prices for the customers”

-JENS MARTION SKIBSTED, SKIBSTED IDEATION A/S
POLICY RECOMMENDATIONS

NCBPA recommends policies for each topic addressed in the section on energy efficiency potential and addresses sections that could facilitate in generating better data for estimated energy efficiency potential.

NCBPA recommends that North Carolina policymakers invest in both a short and long-term commitment to energy efficiency policy opportunities that yield the many benefits identified through this report. NCBPA provides sample legislation of high-priority policy actions that place energy efficiency first and set in motion new efforts to modernize and improve regulated energy efficiency programs. Additionally, recommendations for needed research, data and funding are provided.

CONSUMER EDUCATION

State Energy Education Programs
North Carolina's state energy program, utilities and local governments should act to introduce simple, low-cost and highly impactful energy efficiency education programs into communities across the state. Because energy savings can be attained via DIY projects with readily available materials, unlike solar or nuclear, energy efficiency is the first and best choice for low-cost and high-value benefits.

Local Energy Efficiency Workshops
North Carolina residents could benefit from educational workshops organized by local governments with industry, utility and nonprofit participation. Michigan's Energy Office has a program that provides funding assistance for workshops, conferences and other events with a maximum request of $15,000 that must be matched one to one.

Efficiency Vermont offers a variety of print and online educational materials and workshops that include Button Up Vermont (how homes lose energy and primary opportunities for air sealing and insulation), Mobile Home Efficiency (improvements unique to mobile homes, with a focus on DIY opportunities), Saving Energy in Your Business (savings opportunities and resources available to help small and medium business lower energy costs and improve their bottom line), Slash Your Energy Bills (introductory workshop on reducing energy bills through low-cost efficiency improvements, weatherization, and more), Zero Energy Homes (the path toward a zero energy home with energy efficiency, heat pumps, and solar), and many more.

UTILITY CONSUMER FINANCING
Utilities can play an active role in helping consumers implement energy efficient upgrades in existing homes and buildings without taking on burdensome financial risk or liability in doing so. Two programs beginning to take shape should receive state and local support to expand into more utilities and regions.

Pay As You Save, or PAYS, is a financing option in which the utility pays for the full upfront costs of energy efficiency upgrades and recovers the costs through subsequent monthly charges on the customer’s utility bill. The annual repayments to are capped at 80% of the estimated savings, so the customer would never pay more than the savings. Utility bill payment history determines eligibility instead of credit score so more people can qualify. PAYS is also tied to the property, not an individual so that it can be transferred to new owners or renters. A study by Appalachian Voices determined that this program would yield French Broad EMC and its local economy 62,618 MWh of energy savings determined that this program would yield French Broad EMC and its local economy 62,618 MWh of energy savings worth $1,377,585 over a 10-year period and would create up to $23.1 million in investment and 64 new local jobs.

On-Bill Financing (OBF) is a similar program whereby the utility also provides upgrade funding to help customers overcome the upfront financial burdens. Compared to PAYS, OBF broadens customer eligibility since utility payment history is used instead of a credit score.

STRENGTHEN BUILDING AND ENERGY CODES
North Carolina’s current energy codes focus primarily on energy efficiency in new homes, but could do much more to raise the minimums and establish more stringent requirements for significant remodels and retrofits.

A significant step forward through code would involve using Passive House principles or fundamentals into new construction code requirements. Through this design and construction methodology, homes and buildings are designed and built from the beginning to be low energy users via long roof overhangs, high-efficiency windows and materials, and energy efficient appliances throughout.

Updated Building Codes
According to a report published by Pacific Northwest National Laboratory for the U.S. Department of Energy, adopting the base 2015 International Energy Conservation Code (IECC) would have provided cost-effective savings for residential buildings in North Carolina. Unfortunately, weakening amendments were accepted by the NC Building Code Council due to cost concerns from the housing industry, ignoring scientific data that showed an average life-cycle cost savings of $2,051.79 per home statewide.

The average cost to transition from building with the current 2017 IECC code to the 2015 IECC code would only cost builders $73.92 upfront. These better homes and buildings would offer increased energy savings while adding very little to the upfront cost that would be recouped in the first eight months of ownership through energy savings alone. With electric costs subject to rise nearly $18 per home on average in 2018, the $73.92 upfront cost to builders would help reduce the future energy burden of homeowners by offsetting rising utility costs.

Energy Seat on Code Council
Over the past several years, the most significant area of discussion and disagreement on the NC Building Code Council (NCBCC) involves how stringent minimum energy efficiency requirements should be. NCBPA and energy efficiency advocates believe that a primary cause of these concerns is the lack of an energy industry representative on the NCBCC that, like other trade representatives including plumbing, architecture, heating and air, and general contracting, would be able to represent industry regulations, standards and opportunities specific to changing energy code requirements.

NCBPA recommends replacing a current vacant seat on the NCBCC with an Energy contractor or consultant.

POLICY RECOMMENDATIONS

Multi-family and Rental Energy Efficiency
A strong opportunity to positively impact tenant-paid energy consumption in multifamily and low-income units is to focus on code requirements for existing rental units. Many renters lack necessary energy efficient appliances and materials because landlords have little incentive to reduce energy usage when tenants pay utility bills.

To address this split-incentive, the City of Memphis, Tennessee has a program in place that requires rental properties to meet specific energy efficiency requirements regarding windows, sealing, weather stripping, insulation, heating and cooling equipment and plumbing. Another possible program is the green lease, “an agreement between landlord and tenant to share the cost (and savings) of efficiency upgrades.” Programs like these could offer tremendous benefits to tenants and require owners and property managers to improve the upkeep of their buildings.

Appliance Efficiency Standards
Appliances consume a considerable amount of North Carolina’s energy and water, much of which is going to waste. Appliance energy efficiency standards for commercial, industrial and residential products are another way to influence cost-effective and energy efficient cognizance among North Carolina consumers.

ACEEE’s report, Jobs Created by Appliance Standards (2018), found that U.S. appliance standards would save $2.4 billion in 2020 and those savings would grow for years to come. ACEEE also found that the economic savings and market saturation of new efficient products would create over 12,000 jobs annually.

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Tiered Electricity Rates
Tiered electricity rates apply to residential, commercial, public and industrial customers and work by charging higher energy users higher prices per kilowatt hour, thus encouraging customers to reduce their energy use to access lower rates for electricity. The creation of an Energy Efficiency Bank would provide loans for energy efficiency or renewable energy projects that demonstrate utility savings before loans are approved. A tax on energy inefficient household products, those without the ENERGY STAR label, would further incentivize energy efficient purchases.

Energy Efficiency Permits
Municipalities can inexpensively incentivize energy efficient construction by establishing an expedited permit process for buildings designated as sustainable by a local or reduced permit fees for homes and buildings that meet locally-approved energy efficiency standards, allowable through state law and in-use in a few municipalities across the state.

In California, the City of San Diego has an expedited permit process for buildings designated as sustainable by a local resolution that decreased permit time by 75% and allows sustainable, affordable housing projects to receive second priority. San Diego County also has a local program that reduces building permit, and plans check fees by 75% if efficient construction materials, water conservation, and energy efficiency measures are implemented in new and remodelled residential and commercial buildings.

Energy Efficient Buildings Tax Exemptions
To incentivize building owners to take energy efficiency code measures beyond what is required, North Carolina could offer tax exemptions. The energy efficient tax exemption policy could look like what is offered in Charlottesville and Roanoke, Virginia. These local policies offer exemptions to businesses, industries and residents that work, own, or live a building that is doing one of the following:

- Exceeding state energy building code by 30%
- Meeting or exceeding the Green Globes Green Building Rating System of the Green Building Initiative.
- Meeting or exceeding performance standards or guidelines under the National Green Building Standard program.
- Is an ENERGY STAR qualified home.

Commercial & Industrial
Commercial Opt-Out Program
North Carolina affords commercial energy users with 1,000,000 kWhs of annual energy consumption the opportunity to opt-out of state mandated energy efficiency programs (Commission Rule R8-69 (d)). Unfortunately, many take advantage of this option as their financial motivations focus on short-term returns whereas the majority of energy efficiency options offered to them provide low upfront costs with long-term gains.

Allowing these companies to opt-out of programs results in higher energy costs for all other residential, commercial and industrial energy ratepayers.

Additionally, North Carolina does not allow commercial entities to self-direct their energy efficiency spend to areas where they believe it to be most cost-effective. California does not have the option of self-direct or opt-out, and Michigan has a requirement of annual peak demand of 1 MW for the aggregate of all sites to opt-out. If North Carolina established self-direct, a state oversight process for evaluation, measurement, and verification (EM&V) would need to be created and maintained.

INCREASE PUBLIC BUILDINGS
ENERGY AND WATER SAVINGS GOALS

While the state was successful in achieving the 30% energy and water savings goal of 30% in 2015, many more public and institutional buildings have not acted on valuable energy and water savings retrofit projects.

PRESENTLY, North Carolina’s community colleges have only reached a 17% reduction in energy use, but have still avoided $41.8 million in energy cost. If trends were to continue and community colleges reached the current 30% goal, taxpayer savings would increase by $282 million.

NCBPA recommends increasing the energy and water use reduction goals for state-owned buildings from the initial target of 30% and 20% by 2015 to 40% and 30% (respectively) by 2025.

 Precosts of avoided energy of $1.5 billion in electricity and $1.3 billion in natural gas in 2018.

In 2016, ACEEE’s annual State Energy Scorecard credited North Carolina’s utilities with just 2 out of 20 points for energy efficiency. NCBPA recommends that North Carolina follow Virginia’s lead in encouraging its utilities to invest more in energy efficiency.

After Virginia-based Dominion Energy was ranked as one of the largest utilities with the poorest energy efficiency programs in the country, Virginia’s legislature passed “The Grid Transformation and Security Act of 2018” that requires utilities to spend $1.3 billion in energy conservation efforts in the next decade. Establishing new requirements for North Carolina’s utilities would ensure that energy efficiency is a top priority for the state.

COMMERCIAL & INDUSTRIAL
Commercial PACE (C-PACE)
C-PACE allows building and property owners to finance upgrades and improvements to their buildings and properties by obtaining 100% up-front private market financing with up to 25-year terms via voluntary property tax assessments. Eligible projects must improve the energy efficiency, renewable energy, water efficiency and other performance measures of new and existing multifamily, commercial and different building types.

Specific upgrades available include heating and air conditioning systems, windows and roofing, lighting and insulation upgrades, renewable energy installations, weather-resiliency measures, building automation systems and much more. 33 states and Washington, D.C. have passed enabling legislation resulting in 1,612 commercial projects valued at more than $650 million and helping to create more than 10,000 jobs.

NCBPA recommends that North Carolina enable legislation authorizing this program to yield the many benefits it offers.

Industrial Energy Assessments
North Carolina’s strong industrial sector lends in energy efficiency assessments and upgrades. Currently, NC State works with the Industrial Assessment Center to conduct “free energy, productivity and waste assessments for small to medium-sized industrial facilities.” The program has performed many assessments and given thousands of recommendations, but there is a lack of implementation.

South Carolina implemented a program in 2009 called “Save Energy Now South Carolina” that provided assessments and implementation assistance to industrial facilities across the state. The program has been largely successful and is estimated to save private companies around $4.7 million. Funding a program like this would provide further support for North Carolina’s industrial facilities to take on cost-saving energy efficiency projects.

INCREASE PUBLIC BUILDINGS
ENERGY AND WATER SAVINGS GOALS

While the state was successful in achieving the 30% energy and water savings goal of 30% in 2015, many more public and institutional buildings have not acted on valuable energy and water savings retrofit projects.

PRESENTLY, North Carolina’s community colleges have only reached a 17% reduction in energy use, but have still avoided $41.8 million in energy cost. If trends were to continue and community colleges reached the current 30% goal, taxpayer savings would increase by $282 million.

NCBPA recommends increasing the energy and water use reduction goals for state-owned buildings from the initial target of 30% and 20% by 2015 to 40% and 30% (respectively) by 2025.

INCREASE NET ANNUAL UTILITY
ENERGY SAVINGS

NCBPA recommends legislation that requires regulated utilities including Duke Energy to account for at least 2% of their net annual electricity sales through demand side energy efficiency measures and programs by 2022 with increasing amounts in three-year periods going forward, with a 5% target by 2031. Duke Energy’s efficiency programs currently account for just 1.07% of its net retail electricity sales on an annual basis, despite a 3.13% allowance by 2021 and 5% allowance thereafter through REPS.

In 2016, ACEEE’s annual State Energy Scorecard credited North Carolina’s utilities with just 2 out of 20 points for energy efficiency. NCBPA recommends that North Carolina follow Virginia’s lead in encouraging its utilities to invest more in energy efficiency.

“In reality, studies show that investments to spur renewable energy and boost ENERGY EFFICIENCY generate far MORE JOBS than oil and coal”

-JEFF GOODELL, AUTHOR
ACCESS TO BUILDING ENERGY DATA

Benchmarking is a useful tool to measure and subsequently improve a home or building’s energy efficiency, water efficiency or performance in other categories. With benchmarking, a building’s performance can be measured against itself year over year or month over month and compared to similar buildings to determine how well, or not well, it’s performing. A study by the EPA found that buildings that use benchmarking reduced energy use by about 2.4% per year.

The benefits of benchmarking are seen immediately because merely measuring and gaining awareness of a building’s energy use leads to a modest, yet significant reduction in energy use. New York City recently passed a benchmarking law, requiring owners of large buildings to monitor energy and water usage through the EPA’s online tool, ENERGY STAR Portfolio Manager®. The collected usage data must be submitted to the city and will be used by the owners and city managers to track consumption and plan energy efficiency measures. The data collected will also be distributed publicly and will act as a free resource to building owners.

Legislative updates to Chapter 47E-4 of the North Carolina General Statutes would enable more energy efficiency participation by requiring that energy and water usage and rating data, installation of solar photovoltaics installs and plug-in electric vehicle (PEV) stations, and useful information on other energy efficiency and renewable energy systems be made available through public records and disclosed during sales transactions.

Third Party Access to Energy Use Data

North Carolina’s utilities highly restrict non-utility or direct customer access to energy and water usage data that would help private industry and government offices increase energy efficiency investment across the state. Having third party access to this data would allow the industry to identify homes and buildings that are high energy and water users to determine which efficiency upgrades. Improved visibility would empower building owners to assess how their usage compares to other similar building types and invest in energy or water efficiency upgrades to reduce their operating costs.

NCBPA recommends legislation that opens the market for third party access to energy and water utility data.

NCBPA recommends that North Carolina policymakers invest in both a short and long-term commitment to energy efficiency policy opportunities that yield the many benefits identified through this report.

As referenced in the EPA’s “Energy and Environment Guide to Action: State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Health and Power,” there are a wealth of opportunities available to help North Carolina meet its energy, environmental and economic objectives. Additionally, the Department of Energy offers a solutions center for state and local governments to plan their investment opportunities in energy efficiency.

Supportive state energy efficiency policy opportunities span many categories including utility programs, state energy resource goals, appliance standards, building codes, energy savings, performance contracting, data access and many more. NCBPA recommends a comprehensive review of these opportunities with a focus on prioritizing those that provide the greatest short and long-term benefits with cost and funding considerations taken into account.

Here, NCBPA provides a sampling of high-priority actions that could be legislated by the state to initiate a policy pathway that:

- Solidifies into law that North Carolina policy decisions act on saving existing energy before generating new energy, no matter the source.
- Sets in motion new efforts to modernize and improve regulated utility energy efficiency program cost effectiveness, incentive development and consumer education.

PART XII. ENERGY STORAGE STUDY

Section 12 of the PCS would require the North Carolina Policy Collaboratory at UNC to conduct a study on energy storage including how energy storage may or may not provide value to North Carolina consumers based on capital investments, value to the grid, net customer savings, net job creation, impact to rates and service quality, and other factors. The study must address the feasibility of energy storage in North Carolina, what services energy storage can provide that are not being performed currently, the economic potential or impact of energy storage in North Carolina, and the policies needed or impacted by coordinated energy storage policy. The Collaboratory would be required to report the results of the study to the Energy Policy Council and the Joint Legislative Commission on Energy Policy by December 1, 2018.

EFFECTIVE DATE: The PCS would become effective when it becomes law.
BILL NAME: PRIORITIZING ENERGY EFFICIENCY AS A STRATEGIC STATE RESOURCE

NCBPA recommends new comprehensive state legislation to enable the following activities in support of North Carolina realizing the many benefits available from increased investment in energy efficiency as a strategic state resource:

1. Task and fund (TBD ORGANIZATION/INSTITUTION) to perform a cost-benefit analysis that collects critical utility and market data to enable a thorough prioritization of state, local and possibly federal investment in energy efficiency with benefits that would be realized from the short and long-term activities undertaken.

2. Task and fund NC Department of Environmental Quality with implementing recommendations from the above analysis in creating a new State Energy Plan that effectively prioritizes energy efficiency investment.

3. Mandate Duke Energy to obtain at least 2% of their net annual electricity sales through demand side energy efficiency measures and programs by 2022 with increasing amounts in three-year periods (not via REPS).

4. Establish funding and programmatic support for energy efficiency workforce development resources that will be needed to meet increased demand.

5. Strengthens the rules governing action that Duke Energy must take as recommended by the Collaborative initiative and tasks the group with leading research into key energy efficiency improvement opportunities:
   - Modernizing energy efficiency cost effectiveness testing policies and procedures.
   - Developing and implementing a Technical Reference Manual (TRM) that provides a single reference for regulators and stakeholders to ensure that utility savings estimates are based on correct assumptions.
   - Establishes a long-term pathway that introduces publicly-available energy, water and performance disclosures and benchmarking data in residential, commercial and industrial buildings.
   - Establishes a long-term pathway for investing resources into strategic building electrification.

6. Establishes a (TBD SOURCE) funded consumer education program that educates residents and businesses about ways they can benefit from energy efficiency.

7. Requires the NC Building Code Council to increase residential and commercial energy efficiency minimum requirements by (TBD AMOUNT) during the current code cycle, with additional analysis to be conducted on goals for the next 2021 commercial and 2024 residential cycles.

8. Recognizes October 5th as NC Energy Efficiency Day. This day is already recognized as National Energy Efficiency Day.

FURTHER RESEARCH RECOMMENDATIONS

THIS REPORT IS A FIRST STEP IN UNDERSTANDING THE ENERGY EFFICIENCY BENEFITS AVAILABLE TO NORTH CAROLINA.

NCBPA RECOMMENDS FURTHER RESEARCH TO PRIORITIZE ACTIONABLE STEPS TO REALIZE THESE BENEFITS.
As part of this report, NCBPA performed a gap analysis to identify additional data needed to advance the energy efficiency recommendations we recommend. The EPA offers guidelines to outlining reports that quantify the energy, health, and economic benefits that come from energy efficiency. A research team could use the EPA guidelines, along with the evaluation criteria, reports, and advice we emphasize to create a more thorough report.

BUILDING AND ENERGY CODES

Consult with Pacific Northwest National Laboratory to understand how they arrived at their energy code savings estimates. PNNL could offer insight into which amendments generated the most savings.

North Carolina lacks a comprehensive energy code compliance report for residential and commercial new construction. NCBPA recommends a statewide energy code evaluation to determine the correct compliance rate in order to provide a more accurate estimate of the potential for energy efficiency savings through improved compliance.

The Vermont Energy Investment Corporation has managed evaluations on IECC and ASHRAE for commercial buildings. The Northwest Energy Efficiency Alliance, Navigant, and NWR may also be helpful as these companies have all performed research on residential IECC code compliance. Furthermore, researchers develop case studies using COMcheck or REScheck to test compliance of current buildings themselves.

WORKFORCE DEVELOPMENT

Workforce data is abundant but lacks cohesion. Before workforce development can truly begin, it is essential to define the companies and professionals that make up North Carolina’s energy efficiency workforce. This task could be assigned to the North Carolina Department of Commerce or to other groups involved in workforce development.

Employers face hiring dilemmas because they need employees with specific technical skills. Determining the primary technical skills needed for employment, and the skills that are the most limited would be helpful for policymakers and educators to understand what needs addressing when it comes to workforce development.

UTILITY DATA

When evaluating utilities’ energy efficiency potential, researchers should contact utility companies for their annual Integrated Resource Plans (IRP). The IRP outlines the projected sales and savings from energy efficiency programs. There are also statements on the cost avoided through energy efficiency savings. However, the avoided cost statements are redacted from the public files. Gaining access to the avoided cost data through working with utilities could enable cost-effective research. A cost-effective analysis could provide convincing indications of monetary savings for utilities to go further with energy efficiency.

ELECTRIC COOPERATIVE AND MUNICIPALITY ENERGY EFFICIENCY DATA

This report lacks North Carolina’s cooperatives and municipality data, thus leaving out a third of the electricity supplied to consumers. Gathering data from all energy producers in North Carolina would make the energy savings estimate more inclusive and accurate.

CONSUMER EDUCATION

Most industry stakeholders believe that a lack of consumer education is the greatest barrier to engaging home and building owners in building energy efficiency. To make progress addressing the issue requires two things of consumers: an awareness that changes can be made, and the willingness to make such changes.

Beyond education, consumers need to be engaged and invested in changing their energy use, at home or at work. As with vehicles and energy use, when energy costs are a low percentage of monthly spending, people and businesses engage and care less about changing their behavior.

Hard data on consumers’ understanding of energy usage would help stakeholders understand how to better engage residents and businesses in energy efficiency projects.

The following organizations, reports and resources were referenced or cited in this report. Contact NCBPA for information on specific sources and citations.

1. ResStock State Fact Sheets
2. State, Local and Tribal Technical Assistance Gateway
3. EPIS Power Sector Modeling
4. DOE’s Technical Assistance
5. EERE Evaluation, Measurement and Verification
6. DOE Nation-wide Potential Study
7. ACEEE Job Creation Fact Sheet
8. EPA Emissions Calculation
11. ACEEE Energy Efficiency and Economic Opportunity
15. Cost-Effectiveness of ASHRAE Standard 90.1-2013 for the State of North Carolina
17. Energy and Energy Cost Savings Analysis of the IECC for Commercial Buildings
19. New Home Construction Estimate by the Census Bureau
20. PACEnation.com
21. DSIRE
22. Industrial Assessment Center
23. AE’s Keeping Manufactured Housing Affordable Through Energy Efficiency
24. EIA Energy Data and Energy Use Surveys
25. Building Codes Assistance Project
26. DOE’s Guiding Principles for Successfully Implementing Industrial Energy Assessment Recommendations
27. NCEEQ’s Annual Report for the Utility Savings Initiative for Fiscal Years July 1, 2015 – June 30, 2017
30. 2014 EPRI National Potential Study
31. DOE’s Commercial Buildings Integration Program