HIGH COUNTRY WORKFORCE DEVELOPMENT BOARD INDUSTRY REPORT:

POTENTIAL IMPACTS OF ENERGY EFFICIENCY AND RENEWABLE ENERGY ON A DECLINING CONSTRUCTION INDUSTRY

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About the High Country Workforce Development Board:

The High Country Workforce Development Board (WDB) provides policy guidance and independent oversight for a wide array of workforce development services both for the business community and for the emerging, transitional, and incumbent workforces in the seven-county region. Its mission is to build an adaptive workforce to meet the demands of a globally competitive economy.

Acknowledgements:

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DISCLOSURE

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Purpose

The purpose of this industry report is to bring to light the severity of the declining construction industry in The High Country Region, which consists of the seven most northwestern counties in North Carolina: Alleghany, Ashe, Avery, Mitchell, Watauga, Wilkes, and Yancey. The High Country Workforce Development Board, which works across The High Country Region, represents one of the 23 Workforce Development Boards (WDB) spread across North Carolina. This analysis will also explore energy costs and sources as well as energy efficiency and renewable energy trends in The High Country Region in an effort to highlight how these factors are directly linked to the local economy and to its fledgling construction sector. Implementing energy efficiency services and installing renewable energy systems region wide would reduce the amount of capital flowing out of the area for energy expenditures and would create a new market of products and services that construction based businesses could offer to help revitalize this sector of the local economy. Ultimately, lowering and removing the barriers to energy efficiency and renewable energy education and training programs—via North Carolina policy—would be required to help the High Country construction industry recover and thrive in this new niche market.

Background

The High Country Workforce Development Board (HCWDB) is a participating member of the Future Forward Workforce Alliance, one of four regional teams involved in the State Energy Sector Partnership (SESP) grant project. The funds for this initiative were provided by the American Recovery and Reinvestment Act (ARRA) and were awarded to the High Country WDB by the North Carolina Department of Commerce. Each of the four regional teams is charged with facilitating the training and certification of individuals in the energy efficiency and renewable energy fields, including but not limited to weatherization, renewable energy system installation, home energy retrofits, as well as green construction and deconstruction. This industry report focuses on the impacts of energy efficiency and renewable energy on the construction sector in the High Country, a seven-county region with a total population of 210,049 people (2010 U.S. Census Data).

Figure 1: 2010 The High Country Region Population

Source: North Carolina Sustainable Energy Association

Definition of Terms

For the purposes of this report, the term “renewable energy” refers to energy that comes from natural sources and is naturally replenished; such resources may include solar, wind, biomass, water (hydroelectricity), and geothermal heat. “Energy efficiency” refers to reducing the amount of energy required to provide products and services, usually via technologies and techniques such as energy-efficient appliances and lighting, building design, and energy conservation. In this industry analysis, the term “green construction” encompasses both renewable energy and energy efficiency and may include the following products or services: energy efficient/high performance buildings, passive solar buildings, weatherization (Wx), energy audits, energy retrofits, energy assessments/ratings, renewable energy system installations and maintenance, water efficiency/conservation techniques and devices, improving indoor environmental quality, building with sustainable materials and resources, conducting waste reduction/recycling, and utilizing sustainable site development procedures.

Objectives

Accurately determining the trends of both the High Country construction industry and the High Country energy efficiency and renewable industry sectors will establish the need for educational and training opportunities pertaining to energy efficiency and renewable energy within the green construction sector. Assessing the current energy demands and sources of energy in The High Country Region will allow a determination of how much economic drain this energy importation is placing on the area. Identifying retraining opportunities for individuals employed in the High Country construction industry will not only help provide jobs to individuals who have not been able to retain adequate employment in this sector due to its four-year decline, but it will also serve to stimulate the local economy both directly and indirectly.

Assessment

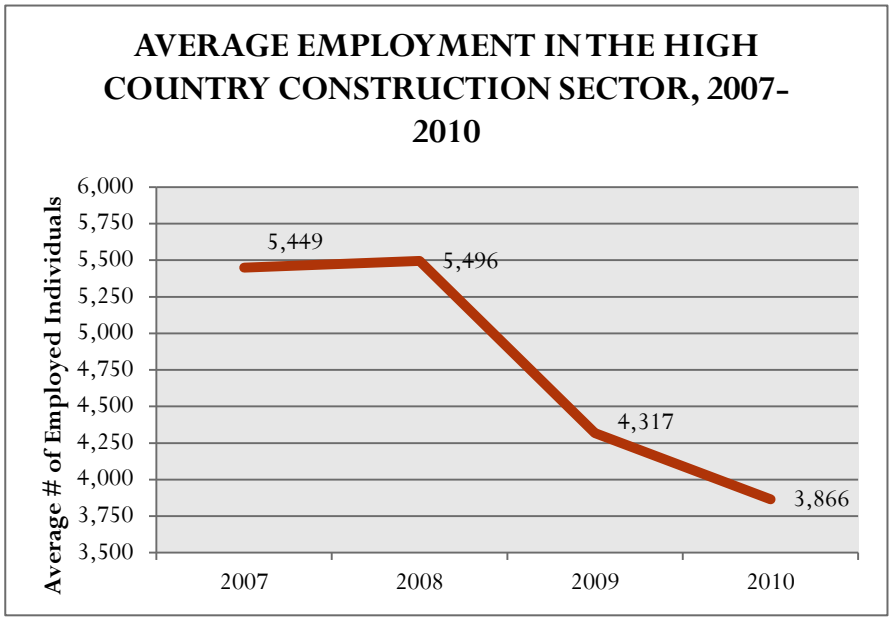
The employment data used in this report is derived from the North Carolina Employment Security Commission’s Quarterly Census of Employment and Wage (QCEW) program. That data is based on the North American Industry Classification System (NAICS) and is provided from 1990 to the present for North Carolina and its 14 Metropolitan Statistical Areas (MSAs), seven Economic Development Regions (EDRs), 23 Workforce Development Boards (WDBs), 18 Planning Regions, and all 100 counties. On its broadest level, the NAICS standard classifies business establishments by two-digit codes into 20 distinct groups for the purposes of economic analysis; the construction sector represents one of these 20 groups and is designated by the NAICS code 23 (U.S. Census Bureau). U.S. Census data, in addition to data from the North Carolina Sustainable Energy Association (NCSEA) 2011 Clean Energy Data Book, was used extensively throughout this report to assess the current housing stock, energy consumption, energy efficiency potential, and renewable energy potential in this region. Economic Modeling Specialists Inc. (EMSI) software and Economic Development Intelligence System (EDIS) software were also used to gather energy use and employment data throughout the region. A complete list of resources consulted and utilized in this report is listed at the back of this document in the Works Cited section.

Construction Sector in High Country Region

Background of the Construction Sector

For perspective purposes, it is important to note that between 2007 and 2010 the construction sector represented, on average, fewer than 10.5% of the total employment within the High Country of North Carolina. In relation to the 20 separate economic sectors identified by the NAICS standard, the construction sector in this region ranked third in total employment, the retail trade sector ranked second, and the government sector ranked first, representing 11.4 % and 15.0 % of the local economy respectively (EMSI). Although construction represents a key economic driver in each of the seven counties in The High Country Region, it plays a more significant role in some counties than in others. In Yancey County for example, the construction sector provided on average more than 15.2 % of the total employment, the highest average for the region. At the lowest end, the construction sector accounted for roughly 7.6 % of Mitchell County's total employment between 2007 and 2010 (EMSI). Due to its high employment status, job losses in the construction sector would almost certainly have a negative impact, both directly and indirectly, on the economic status of this region. Figure 2 shows the general downward trend in the construction sector over the past four years.

Figure 2: Average Employment in the High Country Construction Sector, 2007-2010



Source: ESC of NC, Labor Market Information Division, Quarterly Census of Employment and Wage (QCEW), 2007-2010

Based on the NAICS, the construction sector can be further divided into industry digit levels of three through six. For this assessment, the four-digit NAICS codes, which cover ten main industries within the construction sector, were used. For clarification and definition purposes, the following list also identifies a few, but not all, of the individual sub-industries located under each of the ten main construction industries:

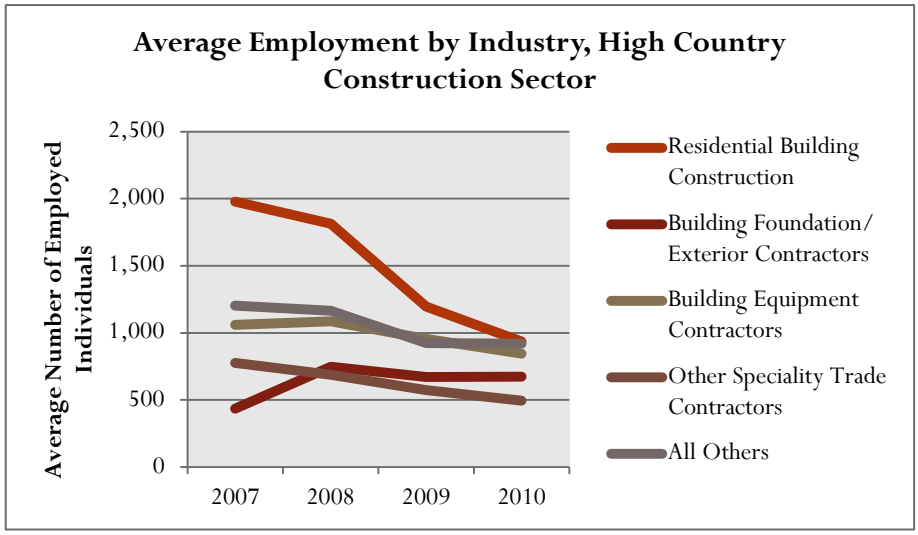
Residential Building Construction (2361)
New single-family housing construction (236115)
New multifamily housing construction (236116)
Residential remodelers (236118),
Nonresidential Building Construction (2362)
Industrial building construction (236210)
Commercial & institutional building construction (236220)
Utility System Construction (2371)
Water & sewer line and related construction (237110)
Oil & gas pipeline and related construction (237120)
Power & communication line and related construction (237130)
Land Subdivision (2372)
Highway, Street, and Bridge Construction (2373)
Other Heavy and Civil Engineering Construction (2379)
Foundation, Structure, and Building Exterior Contractors (2381)
Poured concrete foundation & structure contractors (23811)
Structural steel & precast concrete contractors (23812)
Framing contractors (23813)
Masonry contractors (23814)
Glass & glazing contractors (23815)
Roofing contractors (23816)
Siding contractors (23817)
Building Equipment Contractors (2382)
Electrical & other wiring installation contractors (23821)
Plumbing & HVAC contractors (23822)
Building Finishing Contractors (2383)
Drywall & insulation contractors (23831)
Painting & wall covering contractors (23832)
Flooring contractors (23833)
Tile & terrazzo contractors (23834)
Finish carpentry contractors (23835)
Other Specialty Trade Contractors (2389)
Site preparation contractors (23891)

Source: Economic Modeling Specialists, Inc. (EMSI) Industry Report

Out of these 10 main industries, the scope of the construction industry within this region can be focused into just four: Residential Building Construction (2361), Building Equipment Contractors (2382), Other Specialty Trade Contractors (2389), and Building Foundation/Exterior Contractors (2381). These industries represent more than 87 % of total employment within The High Country Region's construction sector, and out of those, Residential Building Construction and Building Equipment Contractors account for just over 63 % of the construction sector jobs in the

High Country. Because Residential Building Construction represents the largest industry within the High Country construction sector in terms of employment, and due to the fact it has lost significantly more jobs than any of the other nine industries, this section of the report will focus largely on the loss in this area (see Figure 3).

Figure 3: Average Employment in High Country Construction Sector by Industry from 2007-2010

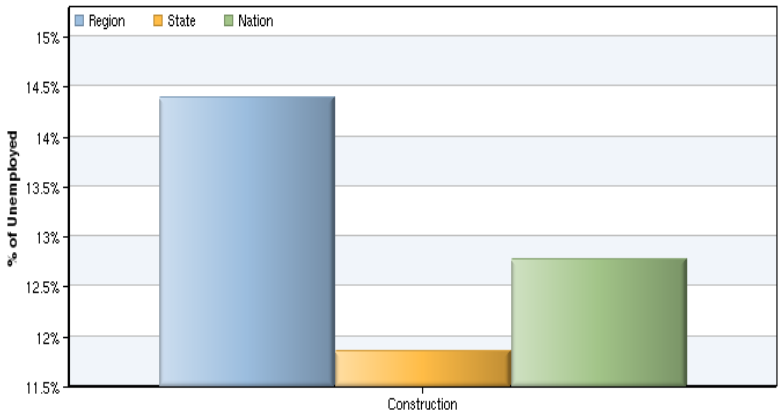


Source: ESC of NC, Labor Market Information Division, Quarterly Census of Employment and Wage (QCEW), 2007-2010

Past and Current Trends of the Construction Sector

As of March 2011, the unemployment rate in the High Country construction sector was 14.4 percent, which was 2.6 % higher than the state construction sector unemployment rate of 11.8 percent. Unfortunately, due to the nature of business organization in the construction industry, these statistics are very likely underestimated. Many individuals in the construction sector are either self-employed or are subcontractors; therefore, they are not eligible for unemployment benefits resulting in their employment status going unreported. Additionally, because it would not be feasible to contact every home in the country each month in order to obtain an exact unemployment rate, the federal government "conducts a monthly sample survey called the Current Population Survey (CPS) to measure the extent of unemployment in the country" (U.S. Bureau of Labor Statistics). The CPS sample is designed to be representative of the entire US population, including urban and rural areas within each state and the District of Columbia. Although these results cannot be completely accurate, the Bureau of Labor Statistics claims that 90 times out of 100, the monthly

Figure 4: 2011 Construction Sector Unemployment Rates (NAICS Code 23)



Source: Economic Modeling Specialists, Inc. (EMSI)

unemployment estimate from the sample is within approximately 290,000 of the figure that would be obtainable from a complete census. Figure 4 compares the construction unemployment rate in the High Country to that of the state and the country.

According to Economic Modeling Specialists, Inc. (EMSI), between 2007, the peak of the construction industry in the High Country, and 2010, this sector lost 2,201 construction jobs, a decrease of 17.81 percent (EMSI, 2011). Statewide, construction declined 23 percent, losing over 93,500 jobs, and nationwide this sector fell by approximately 22 percent, losing just under 2.5 million jobs. The hardest hit county in the High Country region in terms of percentage loss has been Watauga County, which holds the most construction jobs in the region and saw a 28.25 % decline in construction employment for this time period. Mitchell County, which has one of the smallest construction sectors in the region in terms of number of employees, lost 175 jobs over this time period, a decline of more than 26.5 percent. Ashe County and Avery County lost 393 and 384 construction jobs respectively, and Wilkes County was the least affected, losing 85 construction jobs, or just over three percent of its total employment within that industry.

"...between 2007, the peak of the construction industry in the High Country, and 2010, this sector lost 2,201 construction jobs, a decrease of 17.81 percent."

In terms of specific construction industries (refer to the list on pp.7-8), Residential Construction (NAICS 2361), which accounted for approximately 38 % of 2007-2010 employment in the High Country construction sector, suffered the most job losses out of the ten main construction industries. According to an EMSI Industry Report, residential construction lost 1,044 jobs from 2007 until 2010, a decline of more than 52 percent. Although the Land Subdivision (NAICS 2372) industry suffered the highest percentage employment loss of all 10 construction industries, over 65 % to be exact, it accounted for the second smallest industry over the four-year period, representing on average, just over 0.5 % of the entire sector. Ranking behind the Residential Construction and Land Subdivision industries, Building Finishing Contractors (NAICS 2383) accounted for less than five percent of the High Country construction industry from 2007-2010 but lost more than 49 % of its jobs as employment fell from 303 workers in 2007 to 154 workers in 2010.

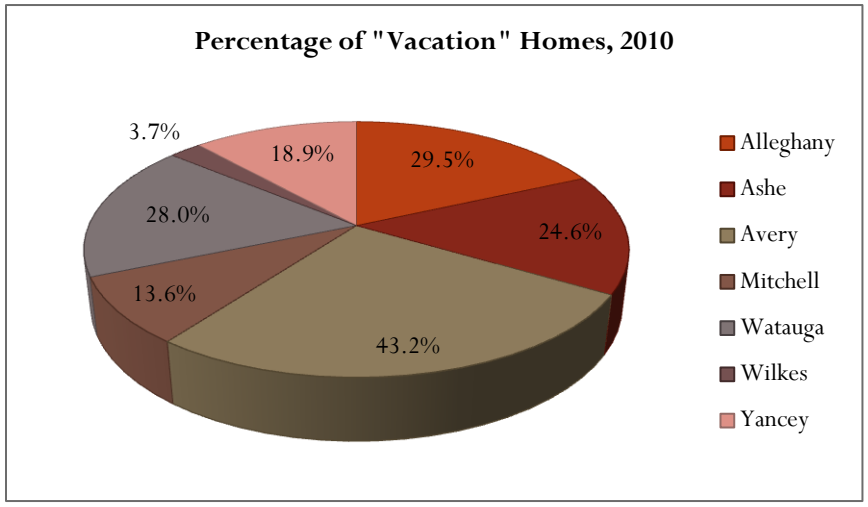
The only two industries to gain employment during this four-year period were Other Heavy & Civil Engineering Construction (NAICS 2379), which excludes highway, street, and bridge construction; and Foundation, Structure, and Building Exterior Contractors (NAICS 2381), which includes concrete, framing, masonry, and siding contractors just to name a few. These industries grew by approximately 48 % and 55 % respectively. Meanwhile, the Utility System Construction (NAICS 2371) industry and the Highway, Street, & Bridge Construction (NAICS

2373) fell by only 2.8 % and 4.4 % during the same time period. Job losses in the other six industries ranged from just over 20 % to more than 65 percent. It is plausible that a combination of large-scale roadway, commercial, or institutional (i.e. school or medical facility) construction projects throughout the region could have resulted in these four industries fairing far better over the past four years than the other six main industries within the construction sector.

Real Estate Market in the High Country Region

The construction sector in the High Country Region has been more negatively affected by the uncertain economy and recent housing crisis than in other areas of North Carolina and the country as a whole. This impact may be due in part to the high number of vacation or second homes that are located within the High Country. The U.S. Census Bureau estimated there were approximately 124,273 housing units in this region in 2010, 21 % of which were listed as "vacation" homes.[1] As seen from Figure 5, Avery County had the highest percentage of vacation homes at over 43 percent, and Wilkes County had the least at just below four percent.

Figure 5: Vacation Homes as Percentage of Total Homes in the High Country, 2010



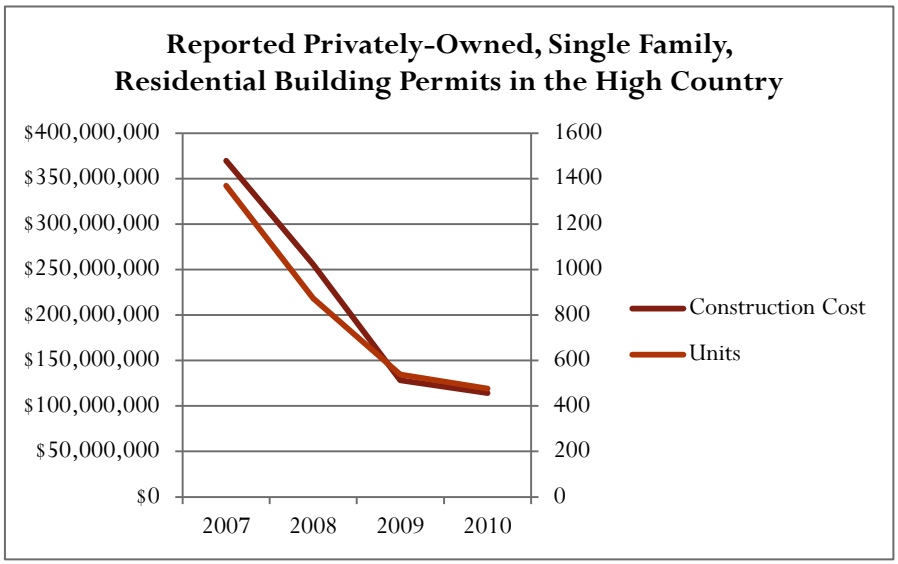
Source: U.S. Census Bureau, "Profile of General Population & Housing Characteristics: 2010"

Based on data from the U.S. Census Bureau it was determined that from 2007-2010, the number of building permits approved for single family housing units declined in each of the seven counties, except for Yancey, which had reported building permits of 0, 1, 2, and 3 for 2007, 2008, 2009, and 2010 respectively (see Figure 6). Total construction costs fell nearly 31% from just over $369.6 million in 2007 to approximately $114 million in 2010. The term construction cost refers to how much money was spent on new, privately-owned, single-family residential construction; this steep drop in new home construction expenditures also means contractors and home builders are losing income and in many cases, work, altogether.

[1]The U.S. Census Bureau defines a "vacation" home as any housing unit intended for "seasonal, recreational, or occasional use".

EDIS and U.S. Census data from the 2000 Census showed that the average median home value in the High Country was $87,496; Watauga County had the highest median home value (and continues to have the highest home value), which was $128,172 in 2000. On the opposite end of the spectrum, Mitchell County has consistently held the lowest valued homes, where the median home value in 2000 was $70,434. The total population, relatively high density of vacation homes, proximity to institutions such as Appalachian State University, proximity to tourism-based facilities such as ski resorts likely contributes to Watauga County's high home values in comparison to some of the other counties in the High Country Region.

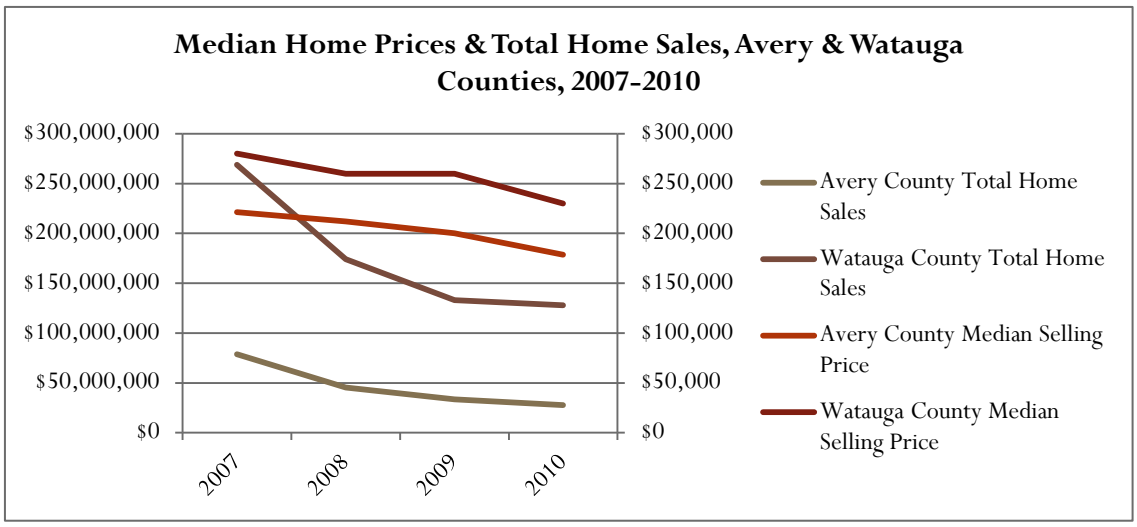
Figure 6: Reported Residential Building Permits in the High Country, 2007-2010



Source: U.S. Census Bureau, http://censtats.census.gov/bldg/bldgprmt.shtml

Despite these positive statistics, home values in the High Country, as in the rest of the country, have declined since the housing market peak in 2007. The Multiple Listing Service (MLS) for the High Country region, which accounts for about 40 %-60 % of the homes sold in Watauga and Avery counties, indicated steady declines in home values from 2007 until 2010. Partial data for 2011 also shows that this decline is likely to continue at least through this year. The MLS data only indicates values for single-family residential homes sold during a particular year, including mobile and manufactured homes. The data does not include sale prices of multifamily housing units or commercial buildings; furthermore, it does not indicate the selling price of homes sold outside of the MLS (an additional 40 %-60 %), nor does it estimate home values for dwellings that are not currently for sale. Nevertheless, the trends in the MLS data should paint a fairly accurate picture of the overall status of the High Country housing market from its peak around 2007 until the end of 2010. As shown from Figure 7, the total value of homes sold and the median price of homes sold in Avery County and Watauga County fell during that time period (Robbie Sharratt, Real Estate Agent, Lyons Construction & Realty, Inc.).

Figure 7: Avery & Watauga County Median Home Prices & Total Annual Homes Sales, 2007-2010



Source: Robbie Sharratt, Real Estate Broker Lyons Construction & Realty, Inc., Blowing Rock, NC

More specifically, the median home price in Watauga County dropped more than 17.8 percent, and the total sales fell by more than 52.4 percent. In Avery County, where vacation homes represented over 43 % of that county's housing stock in 2010 (the highest percentage of vacation homes in the High Country by a significant margin), the losses were more severe. The median home value dropped by more than 19.2 percent, and total sales fell by nearly 65 percent. These statistics coincide with the steep reductions in the construction of new single-family homes over the same time period. Additionally, the first homebuyer's tax credit, which ended in May 2010, helped boost the sale of lower price homes in this region, but once the credit expired, housing prices began to slowly slide again (Lyons Construction & Realty, Inc.). Projections show that the housing market will not return to the record highs seen in 2006 and 2007.

Due to high foreclosures and an oversupply of homes for sale (partially fueled by the overbuilding trend that occurred before the housing bubble burst), home prices and total sales will likely remain low for the months, and possibly years, ahead (New York Times). Housing trends are also revealing that baby boomers and younger generations are purchasing smaller homes compared to several years ago, and first-time buyers are typically planning on residing in their home for 10-15 years compared to older generations, who often bought homes as investments, residing in them for a few years before upgrading to larger ones. A rise in energy prices, tighter credit limits, and a growing presence of first-time buyers (National Association of Home Builders) are helping to fuel these trends, which will likely mean that some workers in the High Country construction sector will have to seek employment in other industries.

Energy and Energy Efficiency in the High Country Region

Despite the significant employment loss in this industry resulting from a decline in new construction of permanent and vacation homes, builders and contractors could potentially take

this opportunity to reclaim some of their lost business by offering energy efficiency and renewable energy services to their customers. The 2011 State of the North Carolina Workforce Report predicted that construction trades will be affected positively by the increased demand for energy efficient and renewable energy technologies, including energy retrofits for homes. This increased demand is likely propagated by rising energy prices and the attractive energy efficiency and renewable energy incentives in the region. Given the significant amount of money that flows out of the High Country's economy each year for energy costs, especially for electricity, energy efficiency measures and distributed (on-site) energy generation represent attractive opportunities for tremendous financial savings to the region's economy.

Energy Consumption & Expenditures

According to the Energy Information Administration, total electricity (including the transportation sector) consumed in North Carolina in 2010 topped 43.3 billion kilowatt-hours (kWhs) and was broken down as follows:

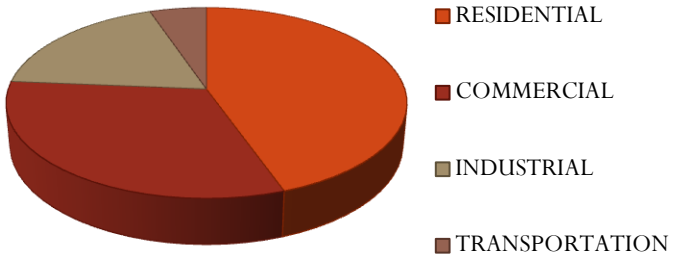
Residential -- 20.3 billion kWh or $6,337,353,000 spent

Commercial -- 14.5 billion kWh or $3,911,350,000 spent

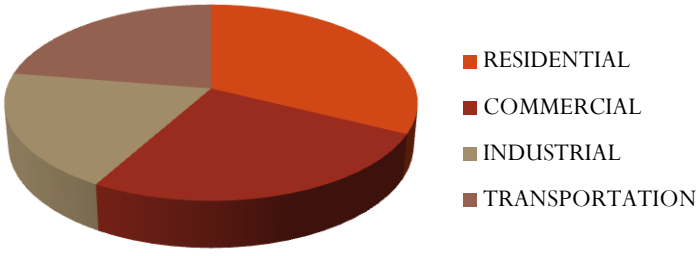
Industrial -- 8.4 billion kWh or $1,627,300,000 spent

Transportation -- 2.4 billion kWh or $500,000 spent

TOTAL -- 43.3 billion kWh or $11,876,504,000 spent



The average 2010 utility rates in North Carolina for each of the four sectors above were as follows:



Residential -- 10.21 cents/kWh

Commercial -- 8.16 cents/kWh

Industrial -- 6.12 cents/kWh

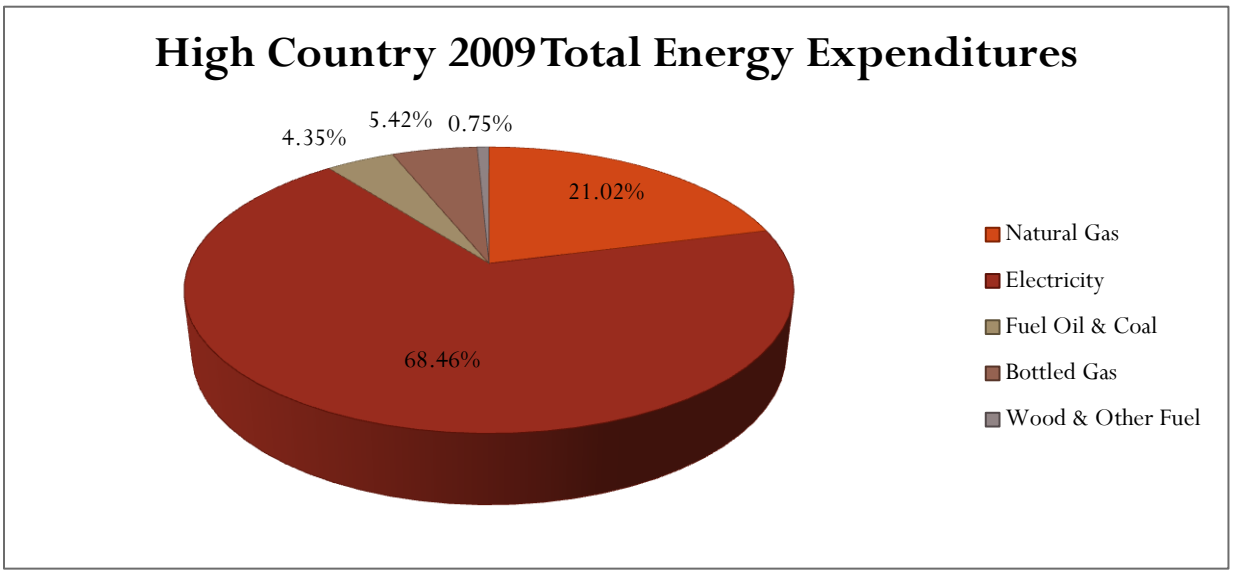
Transportation -- 7.09 cents/kWh

OVERALL AVERAGE -- 8.69 cents/kWh

Almost all areas in the High Country region are served by electric membership cooperatives, also known as "EMCs" or "cooperatives" (North Carolina Electric Cooperatives; North Carolina

Utilities Commission). The majority of these organizations do not own or operate their own power generation facilities; rather, they purchase wholesale electricity through third party organizations and deliver it to their customers. In North Carolina, the average annual electricity consumption by residential EMC customers was 13,741 kWh in 2009. By contrast, the average annual consumption for commercial EMC customers was 35,113 kWh for the same year (NCSEA, 2011 North Carolina Clean Energy Data Book). Based on these annual consumption rates and housing data from the 2010 U.S. Census, residences across all seven counties of the High Country Region collectively consumed less than 1.2 billion kWh of electricity last year, which amounted to roughly $116.4 million in expenditures.

Figure 8: High Country Energy Expenditures, 2009



Source: Economic Development Intelligence System (EDIS), Community Demographics Database, County Report

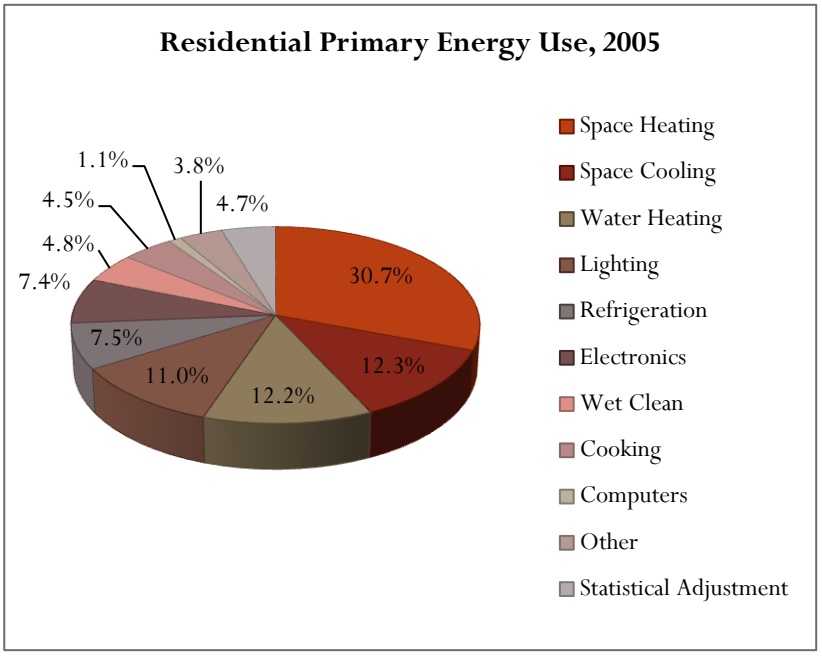
In terms of the percentage of total energy expenditures by fuel source, there is little variation between each of the seven counties in the High Country. For example, the majority of the region's energy expenditures in 2009, almost 68.5 percent, went toward electricity; in all counties, electricity expenditures fell between 67.32 % (Alleghany) and 69.21 % (Mitchell) of total energy expenditures for that year. Figure 8 displays the percentages of total energy expenditures in the High Country for each major fuel source category.

"The High Country Region collectively consumed LESS THAN 1.2 billion kWh of electricity last year, which amounted to roughly $116.4 million in expenditures."

Wood and other fuel sources accounted for the lowest amount of overall energy expenditures, only three-quarters of one percent, on average. Figure 8 represents energy expenditures only, not the actual amount of energy consumed from each type of fuel source; it cannot necessarily be assumed that energy expenditures and energy consumption are directly correlated. Certain fuel sources, including wood and solar, may actually be consumed more than Figure 8 suggests. For example, because many people in the High Country who use wood as a primary or secondary source of heat in their homes during the winter may not have to actually purchase this wood, total energy use from this category would be higher than its actual total expenditures suggest. Solar space (including radiant floor) and water heating systems are becoming increasingly popular methods of heating water and air in residential, commercial, and other non-residential buildings in this area. After the initial cost of these systems is paid (excluding routine maintenance costs over the lifetime of the systems) the energy produced is free, which would reduce the overall amount of money spent on energy in this region. The use of wood, solar, and other renewable fuels and energy sources also reduces the percentage of energy demand from conventional sources such as electricity, natural gas, and petroleum. These factors should be noted when interpreting Figure 8; however, due to the very small percentage that alternative energy sources contribute to this area's overall energy portfolio, it is safe to assume that the statistics above are fairly representative of total energy expenditures in the High Country.

In 2009, total energy expenditures from all seven counties in the High Country Region exceeded $170 million, not including transportation costs (EDIS). As mentioned earlier, more than $116.4 million of the region's energy expenditures resulted from electricity consumption; the remaining $53.6 million in expenditures came from natural gas, fuel oil and coal; bottled gas; and wood and other fuels (EDIS). Energy usage in homes is typically centered around several main categories including heating, cooling, lighting, appliances, and electronics. Space heating is responsible for the

Figure9: Residential Primary Energy Usage in 2005

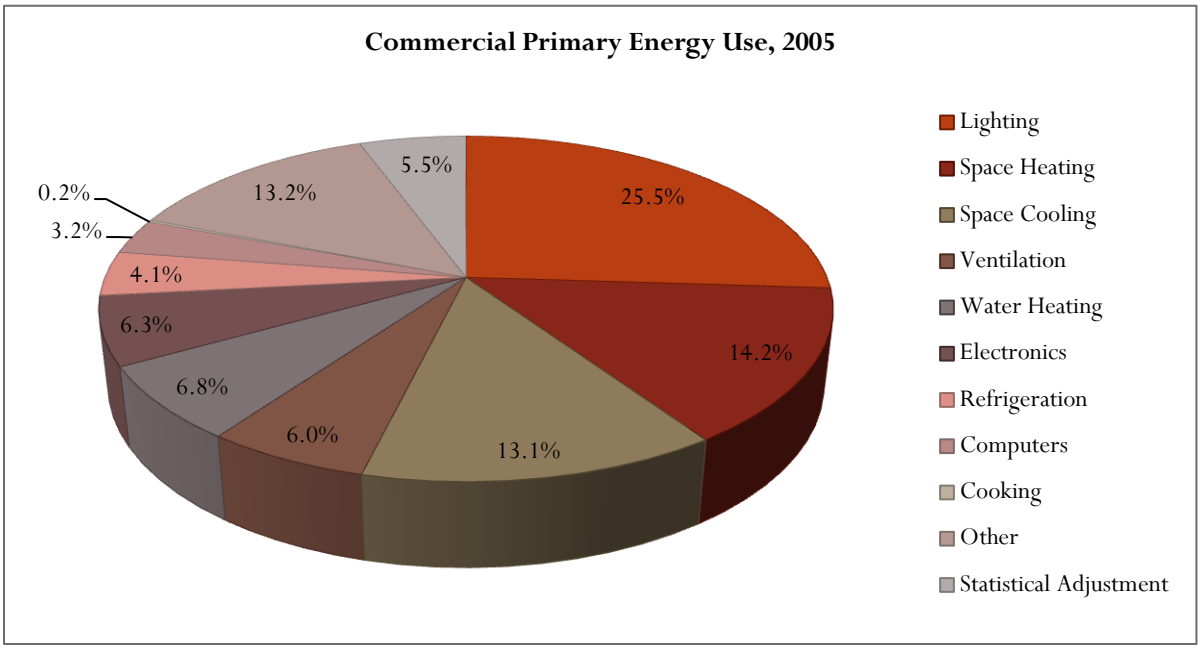


Source: U.S. Department of Energy, Energy Efficiency & Renewable Energy, "Energy Efficiency Trends in Residential & Commercial Buildings," October 2008

Note: The "statistical adjustment" was calculated by the EIA to reconcile two divergent data Sources.

majority of energy consumption in U.S. households at just over 30 percent (see Figure 9). Air conditioning and water heating each account for a little more than 12 % of energy use in homes, followed closely by lighting at 11 percent. Refrigeration typically accounts for approximately 7.5 % of a home's energy use, while appliances and everything else consume the rest, a little more than 26 percent (EIA, Energy Efficiency Trends in Residential and Commercial Buildings). In the High Country Region, these figures most likely differ slightly because summer months are cooler and winter months are colder in comparison to the rest of the state and some other areas of the country. The energy consumption for space heating is probably higher in the High Country, while the consumption for air conditioning is likely much lower than the estimated figures above. Many residences in this area, particularly older homes, do not have space cooling systems, and for those that do, these systems are typically run for a shorter amount of time compared to heating systems because of the general climate in the seven-county region.

Figure 10: Commercial Primary Energy Usage in 2005



Source: U.S. Department of Energy, Energy Efficiency & Renewable Energy, "Energy Efficiency Trends in Residential & Commercial Buildings," October 2008

Note: The "statistical adjustment" was calculated by the EIA to reconcile two divergent data sources.

For commercial buildings, lighting is the overwhelming energy user; accounting for 25.5 % of total energy use in these types of buildings (refer to Figure 10). This area alone represents a huge opportunity for energy savings via energy efficiency measures, especially when considering that new lighting standards (established by the Energy Independence and Security Act of 2007) will phase in from 2012-2014. At a minimum, replacing conventional incandescent light bulbs with more efficient incandescent varieties will result in an energy consumption reduction (for lighting only) of about 25 percent, and the most efficient compact fluorescent lights (CFLs) and light emitting diode (LED) options will use approximately 75 % to 80 % less energy than their traditional counterparts (U.S. Department of Energy, Office of Energy

Efficiency & Renewable Energy, Energy Savers). According to the Office of Energy Efficiency & Renewable Energy (EERE), replacing 15 traditional incandescent light bulbs in a home could result in $50 in annual energy cost savings. If all 86,289 occupied, permanent housing units in the High Country Region did this, more than $4.3 million dollars would stay in the local economy each year instead of being spent on electricity purchased outside of the region. Although the initial purchase prices are more expensive, CFLs typically last 10 times longer than a traditional incandescent bulb, and newer LED bulbs can last up to 25 times longer than their incandescent counterparts. This increase in energy savings and longer lifespan make these bulbs cheaper than conventional varieties over the life of the bulb; furthermore, the U.S. Department of Energy (DOE) reports that CFL bulbs typically pay for themselves in about nine months. As advances in lighting technologies continue and market demand for such products increases, accelerated by the phasing in of the new lighting standard, the higher cost of CFL and LED bulbs are expected to fall. This energy efficiency measure represents just one method for reducing energy consumption and expenditures, but it is by no means the only method available. Home energy retrofits and weatherizations can be extremely cost effective, while savings this region millions of dollars in energy expenditures.

"The number of homes built prior to the change in the building code is likely higher than the 37,231."

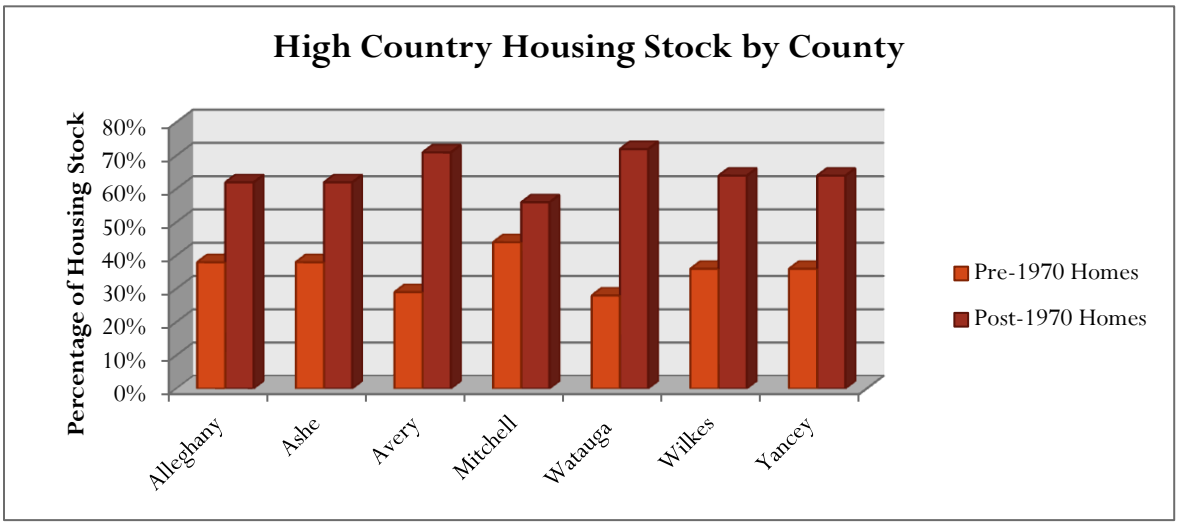
Energy Efficiency Potential

In a recent study by the Lawrence Livermore National Laboratory, which is primarily funded by the Department of Energy, the organization determined that more than 54 quadrillion British thermal units (BTU) of all energy generated (including transportation) in 2009 were wasted. For perspective, one quadrillion ("quad") is roughly equivalent to 293.083 billion kWh, or about the amount of electricity that 25 % (29,308,300) of the total U.S. households will use in one year (assuming that the average U.S. household consumes a very conservative 10,000 kWh of electricity per year).[2] Of the 54 quads of energy that were wasted in 2009, 2.25 quads (659 billion kWh) were wasted in the residential sector, which is equivalent to the amount of electricity used in more than 56 % of all U.S. households. Conducting simple energy retrofits of existing homes and requiring stricter energy efficiency standards for new construction could go a long way toward reducing the amount of energy that is consumed and wasted throughout the residential sector in the High Country Region each year.

[2]Per the 2010 U.S. Census Data, there were 116,716,292 total occupied housing units, also known as "households", in the United States (2010 U.S. Census, "Profile of General Population and Housing Characteristics: 2010, 2010 Demographic Profile Data", http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1&prodType=table).

In order to predict how much local economic gain could be realized from energy efficiency projects, it is first critical to assess the available opportunity for energy efficiency in this region. For example, determining housing age and the number of manufactured homes as a proportion of the total housing stock represent two means of evaluating energy efficiency opportunities within the residential sector of the High Country [North Carolina Sustainable Energy Association (NCSEA), NC Clean Energy Data Book, 2011]. According to the NCSEA's *Clean Energy Data Book*, over 35 % of the homes in the seven counties of the High Country Region were built prior to 1970 (see Figure 11). The North Carolina Building Code did not require insulation for homes

Figure 11: Number of Pre-1970 & Post-1970 Homes in the High Country, 2010

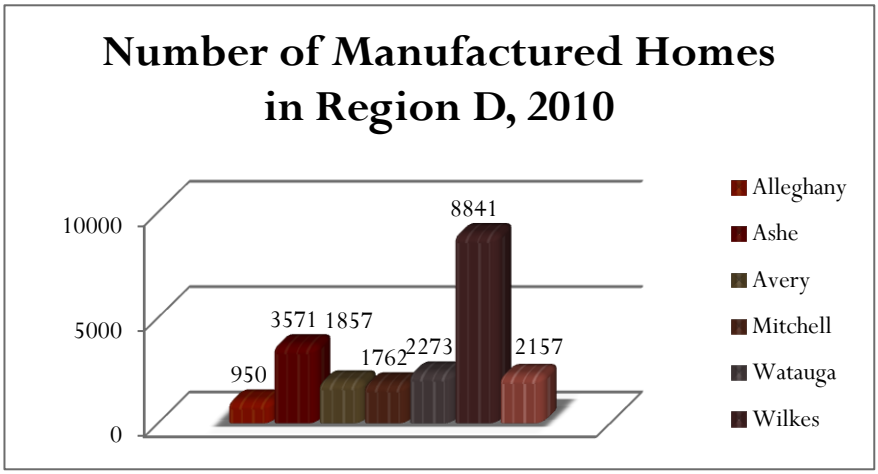


Source: North Carolina Sustainable Energy Association (NCSEA), 2011 NC Clean Energy Data Book

built prior to 1975; therefore, it could be assumed that the majority of the 37,231 homes built in the High Country before 1970 currently have no insulation, unless the original homeowner requested insulation at the time the home was built, or one of its owners added insulation during a renovation conducted at a later date. The number of homes built prior to the change in the building code is likely higher than the 37,231 specified above, but data collection was based on Census data, which is only available in 10-year increments. Assuming the homeowners in this area are financially able to pursue energy efficiency improvements such as home energy retrofits, this type of service could represent a viable business opportunity for individuals employed in the region's construction industry. In addition to non-insulated homes, the High Country also has at least 21,411 manufactured residences (see Figure 12), which can consume as much as 67 % more energy per square foot than conventional single-family detached homes (NCSEA, NC Clean Energy Data Book, 2011).

Although older houses represent a significant opportunity for energy and financial savings, newer houses also suffer high energy losses. Fortunately, steps have been taken in recent years to make home buyers and industry professionals more aware of energy efficiency principles and technologies. Energy Star, a program managed through the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), is one of the most popular of the third party verified energy saving certifications available in the market. Energy Star certified homes are typically 20%-30% more efficient than standard homes and often result in homeowners being "cash positive" upon move in, meaning any modest increase in a mortgage payment resulting from the increased cost to build is more than fully offset by the monthly utility savings. Many builders argue that it is too costly to make improvements needed during construction to achieve Energy Star certification; however, several studies have now shown that the cost of upgrading pays for itself within a short period of time.

Figure 12: Number of Manufactured Homes in the High Country, 2010

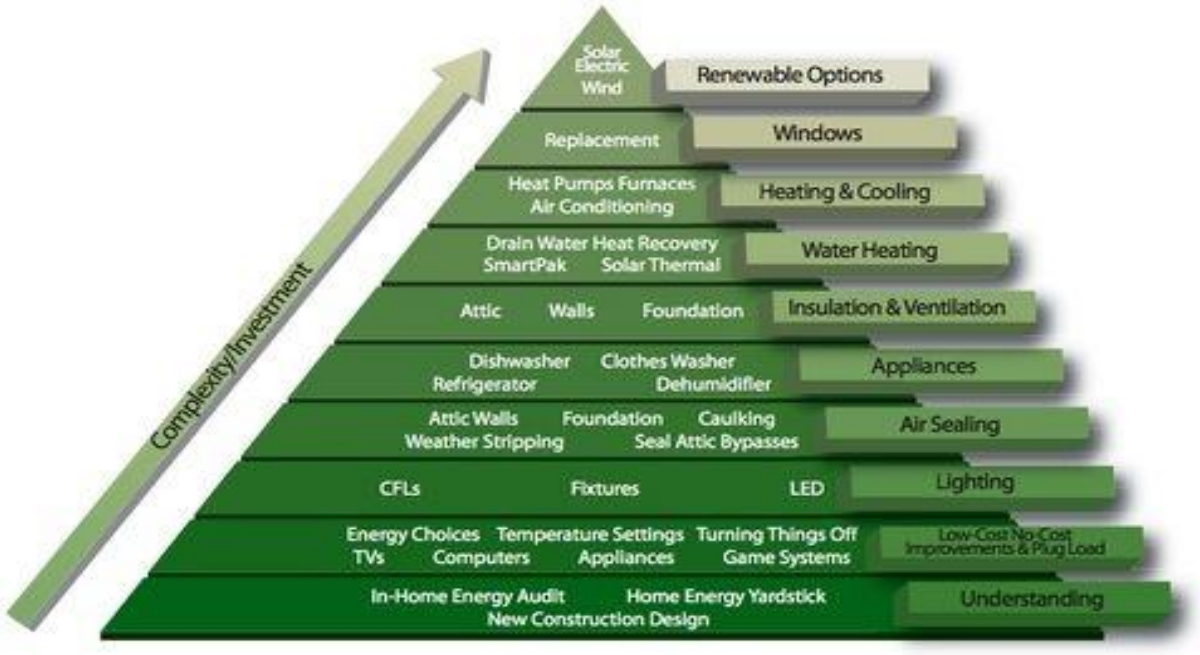


Source: North Carolina Sustainable Energy Association (NCSEA), 2011 NC Clean Energy Data Book

Savings from Energy Efficiency & Costs to Retrofit

The cost and resulting savings from building retrofits varies widely and depends on several factors, including but not limited to the size of the home, age of the home, and type of improvements made. These initiatives can range anywhere from having a home energy audit conducted, or designing a green house, all the way up to replacing appliances, doors, and windows. As shown in the Pyramid of Conservation in Figure 13, basic energy efficiency projects are relatively simple and inexpensive (sometimes free) measures that increase in complexity and price and eventually culminate in the installation of a renewable energy system such as photovoltaic arrays and wind turbines.

Figure 13: Pyramid of Conservation



Source: Minnesota Power, http://www.mnpower.com/powerofone/one_home/resources/residentialpyramidw-bottomspace.pdf

Despite the numerous variations of energy efficiency measures that can be taken, it appears that green building methods, energy retrofits, and weatherization for homes generally yield energy savings of approximately 30 percent. For example, as mentioned earlier, Energy Star certified homes are typically 20%-30% more efficient than standard homes, and the Weatherization Assistance Program (WAP) sees on average a 32 % reduction in energy consumption in the homes that it weatherizes. This DOE program enables low-income families to make their homes more energy efficient through weatherization techniques such as air sealing, duct sealing, adding insulation, replacing inefficient light bulbs, replacing leaking windows and doors, and upgrading or repairing inefficient appliances. Using the annual average residential electricity usage of 13,741 kWh from the NCSEA estimates, a High Country household could save almost $375 in the first year by cutting its energy usage by 30 percent; this house would now use approximately 9,618 kWh per year.

Assuming that all 37,231 homes built prior to 1970 in the High Country Region used 13,741 kWh of electricity per year at the average electric rate for the region of $0.090929/kWh, and that these homes were retrofitted to be 30 % more energy efficient, total energy savings for the first year after the retrofit would be more than 358 million kWh, which translates to over $32.5 million. Using the same annual consumption rate and average utility rate, if all 21,411 manufactured homes in the High Country were retrofitted to be 30 % more energy efficient, the total energy savings for the first year after the energy retrofit would be over 205 million kWh, or over $18.7 million. In terms of more generic energy savings calculations and using EDIS's 2009

total energy expenditures data for each High Country Region county, Table 1 shows both county and regional savings based on specific energy reduction goals for each county.

Table 1: Savings from Energy Efficiency in the High Country

SAVINGS FROM ENERGY EFFICIENCY						
	2009 Expenditures	10% Energy Reduction	15% Energy Reduction	20% Energy Reduction	25% Energy Reduction	30% Energy Reduction
Alleghany	$10,133,649	$9,120,284	$8,613,601	$8,106,919	$7,600,236	$7,093,554
Ashe	$22,619,559	$20,357,603	$19,226,625	$18,095,647	$16,964,669	$15,833,691
Avery	$13,152,803	$11,837,522	$11,179,882	$10,522,242	$9,864,602	$9,206,962
Mitchell	$13,384,748	$12,046,273	$11,377,035	$10,707,798	$10,038,561	$9,369,323
Watauga	$35,755,922	$32,180,329	$30,392,533	$28,604,737	$26,816,941	$25,029,145
Wilkes	$59,146,224	$53,231,601	$50,274,290	$47,316,979	$44,359,668	$41,402,356
Yancey	$15,848,250	$14,263,425	$13,471,012	$12,678,600	$11,886,187	$11,093,775
TOTALS	$170,041,155	$153,037,039	$144,534,981	$136,032,924	$127,530,866	$119,028,808
REGIONAL SAVINGS		$17,004,115	$25,506,173	$34,008,231	$42,510,288	$51,012,346

Source: Economic Development Intelligence System (EDIS), Community Demographics Database, County Report; High Country Workforce Development Board

These initial savings and subsequent savings on monthly energy bills more than make up for the additional cost of retrofitting and weatherizing a home. Numerous energy efficiency and renewable energy incentives are available that can significantly reduce these up-front costs and the payback period for these investments. Federal, state, and local incentives are available to residential, commercial, and industrial customers participating in energy efficiency and/or renewable energy initiatives. Most incentives come in the form of tax credits and rebates that cover the costs of assessments, retrofits, purchases of appliances and lighting, as well as the installation of solar thermal systems and other renewable energy systems. There are also numerous financial incentives offered for the construction of Energy Star and other certified green homes. A complete and updated list of incentives available to customers in the High

Country Region is available on the Database of State Incentives for Renewables & Efficiency (DSIRE) website at http://www.dsireusa.org/. Many of the local utilities and electric cooperatives also offer incentives and programs that may not be listed on the DSIRE database, and some companies offer special sales and offerings for the purchase of energy efficiency appliances and materials.

Before proceeding with any energy retrofit it is important to have an energy audit conducted on a building to determine the problem areas and to best maximize the energy savings achieved per dollar spent. Most energy audits for an average sized home in this area will cost between $300 and $500, although there can be some variance due to company selected, complexity of the audit, and the size of the home. After identifying the issues in a building, the next step in increasing the energy efficiency of a building is to have an energy retrofit performed. Through consulting various energy blogs and energy efficiency company websites, including speaking with a representative from Building Performance Engineering (BPE) in Boone, it appears that it would take approximately $5,000-$10,000 to complete a basic weatherization on a 2,000 square foot home, an average size home for North Carolina. For most homes in the region, particularly ones built after 1975, it will take an energy retrofit costing about $10,000 to reduce the home's energy usage by about 30 percent. Retrofits on older homes and inefficient larger homes could potentially cost significantly more to achieve the same energy savings, while smaller homes and more efficient homes could cost just a few thousand dollars. Services included in the retrofit will obviously impact the overall price, and most of these projects typically, but not always include the following procedures:

- air sealing (critical for increasing energy efficiency)
- duct sealing (critical for increasing energy efficiency)
- HVAC system tune up
- adding insulation in the attic and crawlspace
- sealing the crawlspace (not always done)
- conducting combustion safety and ventilation procedures

WAMY's Weatherization Assistance and Heating Appliance Repair and Replacement program assists low-income families in Watauga, Avery, Mitchell, and Yancey counties to permanently lower their energy bills by making their homes more energy efficient. This organization offers various weatherization and energy efficiency measures to its clients:

- air sealing, caulking, and weather stripping
- attic and floor insulation
- heating and air conditioning system (HVAC) tune up/replacement
- cleaning and tuning of central furnaces to improve efficiency
- inspection, sealing, and insulating duct work
- water heater and pipe insulation
- installation of energy efficient compact fluorescent light bulbs (CFLs)
- carbon monoxide and smoke detector installation
- refrigerator assessment and possible replacement

Achieving energy savings higher than 30 % could cost upwards of $20,000 or more but would typically involve more complex and labor-intensive steps such as the following:

- foaming inside wall cavities
- adding blueboard to the outside of the home
- sealing the crawlspace and implementing dehumidification measures
- properly ventilating the residence
- installing a new, more efficient HVAC system

Pre-1970 and manufactured homes represent the largest potential for energy efficiency improvements in the area in terms of housing stock. Because financially disadvantaged individuals and families more likely reside in these types of homes compared to financially secure individuals and families, targeting these housing types would be economically beneficial to the High Country. WAMY has taken advantage of this potential and currently accounts for the majority of the weatherization market in the region, but there is still abundant potential for energy retrofits in the post-1970 and non manufactured housing stocks. Of the 124,273 total housing units in the region (2010 U.S. Census), including vacant and vacation homes, more than 70 % were built after 1970, and more than 82 % are non-manufactured dwellings. This potential does not include commercial and industrial buildings in the region, and according to the NCSEA's *2011 Clean Energy Data Book*, there are at least 24 registered and/or certified energy efficient commercial buildings in the High Country.

Energy efficiency potential is very promising for the High Country construction sector, particularly considering the current volatility in energy security and energy prices. According to the International Energy Agency's (IEA) *World Energy Outlook*, oil prices and subsequently, overall energy prices are expected to continue rising steadily along with worldwide energy consumption into the foreseeable future. The publication also notes that the potential for energy efficiency depends largely on government policy, including energy pricing, market reform, and financing.

Fortunately, more favorable energy efficiency policy is coming to North Carolina. In December 2010, the North Carolina Building Code Council voted to increase energy efficiency standards in new homes and buildings, which will take effect in January 2012 and will be mandatory by March of that year. Under the new requirement commercial buildings must be at least 30 % more energy efficient than commercial buildings under the current standards, and residential buildings must be at least 15 % more efficient compared to present requirements (NCSEA News). Builders, who elect to build residential structures to the stricter 30 % efficiency standards, or above, will receive special recognition. With the new amendments to the NC Building Code and IEA's predictions of rising energy prices along with the unstable nature of energy security, the demand for energy efficiency practices in this region are likely to continue increasing in the years to come.

Renewable Energy Industry in the High Country Region

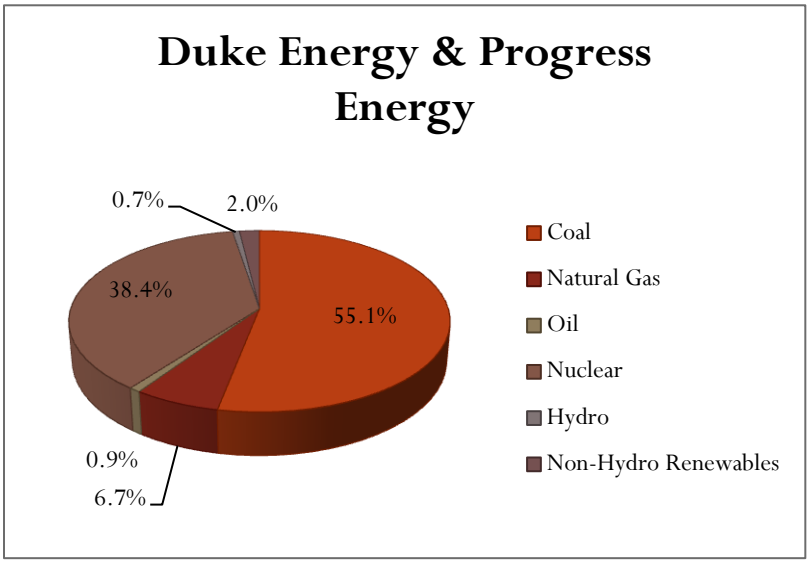
Favorable state and federal incentives, in addition to future energy price projections and concerns over climate change, will also create opportunities for bringing renewable energy projects to the High Country. Energy efficiency and renewable energy go hand-in-hand, and producing sustainable forms of energy locally (known as distributed generation) will go a long way toward keeping energy dollars in the local economy. Any energy efficiency projects will indirectly support the local economy because households and businesses will have more discretionary, or disposable income (due to energy savings), while renewable energy projects will directly support the local economy by producing and selling renewable power on a municipal or regional level, which keeps more money in this region and creates new jobs in the region as well.

Current Trends in Renewable Energy

The High Country currently imports nearly all of its fuel sources, resulting in billions of dollars leaving the local economy each year. In 2007, total fuel resource imports totaled more than $17 billion, of which only $1.5 billion came from in-state sources (North Carolina State Energy Report, 2010). In the High Country, the majority of fuel resources are coal--55.1% of the power provided originates either from Duke Energy or Progress Energy, and 66.1% if the power provided originates from Tennessee Valley Authority (TVA) (U.S. EPA Power Profiler). Renewable energy generation (excluding nuclear and hydro) accounts for 0.9 % of total energy generation for TVA and makes up approximately 2 % of total generation for both Duke Energy and Progress Energy (see Figures 14 & 15).

The High Country currently imports nearly all of its fuel sources, resulting in billions of dollars leaving the local economy each year. In 2007, total fuel resource imports totaled more than $17 billion, of which only $1.5 billion came from in-state sources (North Carolina State Energy Report, 2010).

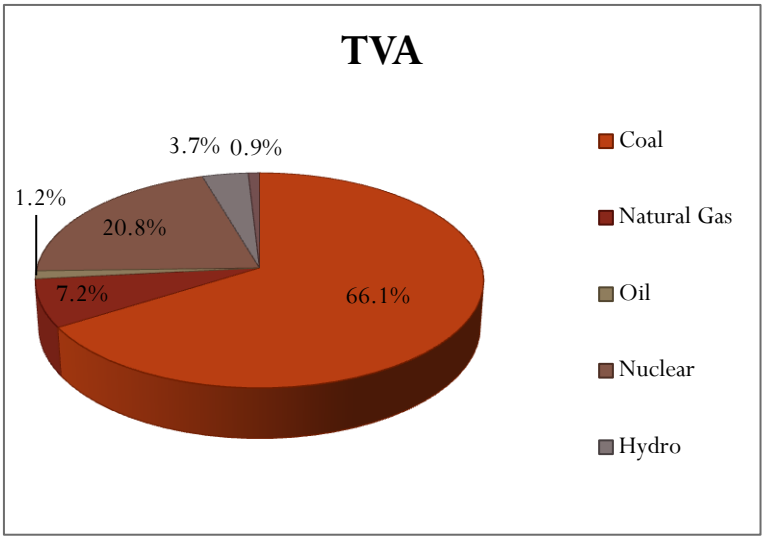
Figure 14: Power by Source, Duke Energy & Progress Energy



Source: U.S. EPA Power Profiler

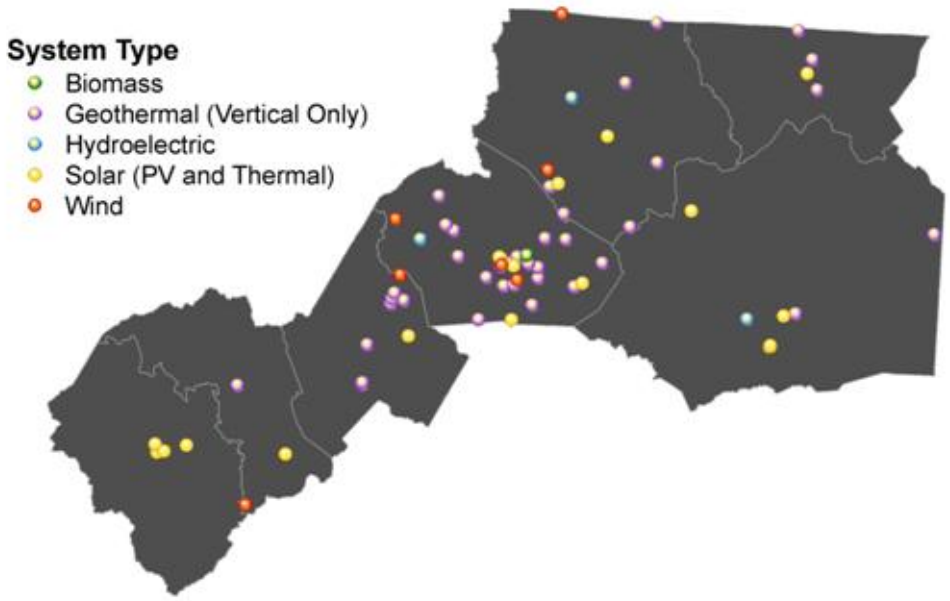
According to figures from the *2011 North Carolina Clean Energy Data Book*, there are 85 identified renewable energy systems (see Figure 16) in the High Country, excluding a hydroelectric project that has been proposed at Kerr Scott Reservoir in Wilkes County for several years. Off-grid renewable energy systems (those that are not connected to the electricity grid) are not included in these 85 systems, nor are systems currently under construction or those under proposal for construction. Thermal energy systems that do not necessarily require any grid connection or electricity use including solar thermal collectors, geothermal heating and cooling systems, and anaerobic digesters for biogas production are also not counted in this total. Due to the these factors and the difficulty of identifying each of the systems connected to the numerous utilities and EMCs that serve the High Country Region, there are likely many more renewable energy systems located within this region. The impact of these undocumented systems, including any thermal systems, should still be noted because of their ability to reduce a building's demand for electricity or other energy sources, which are almost always derived from non-renewable resources in this region. In terms of the thermal-based energy systems, they are typically simple, efficient, and cost-effective when compared to conventional energy sources and power generation methods. For example, solar thermal water and space heating systems are approximately 70% efficient, and passive systems require no outside energy input to operate. There is great potential for these types of renewable energy systems in the High Country, which would help reduce the amount of energy dollars leaving the local economy each year and increase the construction job opportunities in the region as well.

Figure 15: Power by Source, TVA



Source: U.S. EPA Power Profiler

Figure 16: Registered Renewable Energy Systems in the High Country



Source: North Carolina Sustainable Energy Association (NCSEA), 2011 NC Clean Energy Data Book

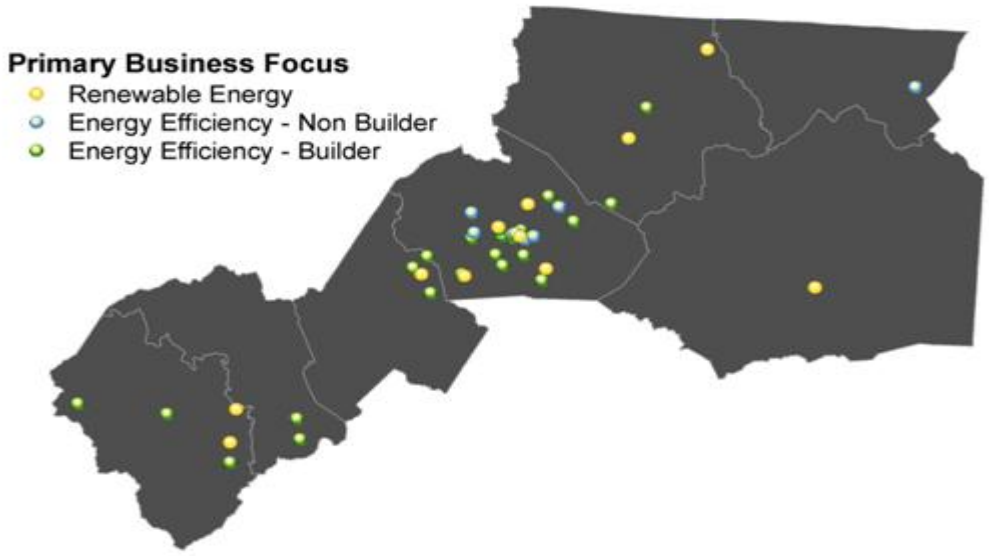
Although the rate of construction and installation of renewable energy systems in the High Country has been mostly steady over the past couple of years, the overall percentage of energy use deriving from renewable sources in the region is still incredibly small compared to the amount of energy use from conventional energy sources. In addition, there are very few power generation facilities in the High Country. Case in point- there are ten utilities including two investor-owned utilities currently serving Alleghany, Ashe, Avery, Mitchell, Watauga, Wilkes, and Yancey counties. With the exception of a few small hydroelectric dams and several renewable energy systems that are mostly owned by citizens and private companies, none of these counties have any generating facilities. Therefore, the majority of the $170 million spent by this region in energy expenditures for 2009 was ultimately sent out of the local economies to other areas of our state, namely to Progress Energy, Duke Energy, and Tennessee Valley Authority. However, there is currently more than 758 kW of renewable energy capacity in the High Country from various photovoltaic, wind, biomass, and hydroelectric systems. These systems generate collectively more than 3.5 million kWh of electricity per year, which is enough energy for approximately 256 homes, or 0.228 % of the 112,436 “occupied” and “vacant vacation” homes identified in this region by the 2010 U.S. Census. If the thermal energy generated from solar thermal and geothermal systems is taken into account, this percentage would be higher, but not by much in comparison to the total amount of homes in the region and the total annual energy consumption among these homes. The new 1-MW (1,000-kW) solar farm in Avery County will more than double the current renewable energy capacity in the region increasing the total annual energy production to just over 4.5 million kilowatt hours. All of these renewable energy systems, including the new solar farm, should produce enough annual energy to power approximately 329 homes in the High Country. This projection is very conservative as

project officials at the solar farm estimate that the array will produce enough energy for 100-120 area homes.

For comparison purposes, North Carolina possessed 41.2 megawatts (MW) of photovoltaic capacity in 2010, which is the equivalent of 41,200 kW (American Solar Energy Society) while the High Country Region's PV capacity as of the writing of this report was approximately 134 kW or 0.325 % of the state's total installed capacity in 2010. Including the nearly-completed Avery County solar farm, the total photovoltaic (PV) capacity for the High Country will be approximately 1,134 kilowatt, or roughly 2.75 % of NC's total 2010 capacity. As new solar projects are constructed in this region the High Country will represent an increasing share of the state's total PV capacity. The area also has considerable potential, from a resource perspective, for the development of wind energy, biomass, small-scale (run-of-river) hydroelectric systems, and geothermal energy systems.

In addition to the region's potential for energy efficient homes and buildings as well as renewable energy systems, this area is currently the home of at least 47 existing clean energy firms (see Figure 17) - businesses that focus on renewable energy, non-builder energy efficiency, builder energy efficiency, smart grid or energy storage, or some combination of the four (NCSEA, 2011 NC Clean Energy Data Book). Watauga County has over half of these businesses (28) while Alleghany and Wilkes have the least amount of green businesses, with one in each of those counties. These types of businesses have increased steadily since just before the economic downturn began, and as more energy efficiency and renewable energy projects come to this region, more clean energy firms are likely to follow. Counties such as Alleghany, Mitchell, and Wilkes that have high potential for residential and commercial energy efficiency projects and/or developable renewable energy resources could benefit the most from starting clean energy firms in their local economies.

Figure 17: Existing Clean Energy Firms in the High Country



Source: North Carolina Sustainable Energy Association (NCSEA), 2011 NC Clean Energy Data Book

Projected Trends in Renewable Energy

The potential for local renewable energy projects is much larger than the 758 kW of current installed capacity. Biomass, landfill gas, solar, wind, geothermal, and hydroelectric resources are particularly abundant in this region. The National Renewable Energy Laboratory determined that western North Carolina has an available solar resource of approximately 4.0-5.0 kWh/m²/day, an instantaneous rate of power that is equivalent roughly to four or five 100-watt incandescent light bulbs burning for one hour on every 10.76 square feet of area at any one point in time throughout the day. Solar energy can be captured to create electricity in photovoltaic (PV) systems and to create thermal energy in solar hot water and space heating systems, which are much cheaper and more efficient than their electricity-generating counterparts. The High Country also has pockets of considerable wind resources in every county except Wilkes. Ashe, Avery, and Watauga counties have three of the five best wind resources in western North Carolina. The highest wind speeds and thus the best locations for wind turbines are found along the mountain ridge tops, and 35 viable utility-scale wind sites have been identified in the area (including consideration for transmission, viewshed, and other factors) [ASU Energy Center]. Due to conflicting opinions on wind turbine development in the region, widespread wind energy development, particularly large-scale projects, will likely face considerable opposition in most of the High Country depending on location and future legislative action.

However, solar energy projects appear to have a particularly promising future in North Carolina, including in the High Country region. In 2010, the state had approximately 4.32 watts of installed PV per resident and a state market growth of 229.6 % from the previous year. North Carolina has the most installed PV capacity of any state in the Southeast except for Florida; which, as of 2010, has almost double North Carolina's capacity (American Solar Energy Society). Large solar companies, including Strata Solar of Chapel Hill and O2 Energies of Cornelius, have a successful history of solar installations in North Carolina. These two companies are responsible for the 1-MW solar farm in Avery County. Several other solar electric and solar thermal projects across the High Country are being planned including, but not limited to, a solar thermal hot water system and a photovoltaic array at the Mountain Heritage Expo Center in Micaville, Yancey County (Yancey Common Times Journal); a four-county photovoltaic project in Avery, McDowell(not in the High Country region), Mitchell, and Yancey that will produce more than 10 MWs of energy each year (Yancey Common Times Journal); and a potential 4.5-kW photovoltaic "A" to be installed at ASU's Kidd Brewer Stadium (ASU Renewable Energy Initiative).

The resource potential for renewable energy systems in North Carolina and in the High Country Region is immense; however, there are key barriers that must be addressed in order to aid the widespread adoption of distributed generation:

- improve/introduce interconnection standards and net metering
- raise net-metered system size limits while increasing overall program size caps
- standardize all utilities' interconnection standards (Lillian, 2011)

In terms of renewable energy potential on a larger scale, the *World Energy Outlook* predicts that government support for renewable energy projects will increase as these technologies become more competitive with conventional energy generation technologies as their contribution to the global energy mix increases. Despite the fact that most renewable projects are currently very capital intensive, the International Energy Agency (IEA) reiterates that these types of projects must play a central role in increasing future energy security and sustainability. Furthermore, the IEA, via its *World Energy Outlook* publication, stressed that the power sector will largely determine the future potential of renewable energy projects, as indicated by the above listed key barriers to renewable energy development. While some conflicts with local utility interconnections may pose challenges to developing renewable energy projects in The High Country Region, there are numerous federal and state incentives available for such projects, including incentives provided by some local utilities and Electric Membership Cooperatives. Additionally, as large companies continue to develop and install community and large-scale projects in this region, the cost of such projects and renewable technologies will continue to decrease, thereby making renewable energy systems (particularly solar) more affordable for residential and small business purposes.

Conclusions

Although the High Country construction sector no doubt has suffered, and continues to suffer, from the economic recession and the bursting of the housing bubble, the large potential for energy efficiency projects and renewable energy installations in this area could put more construction workers and contractors back to work. Energy efficiency projects are typically simpler and more cost-effective, and in addition, have shorter payback periods than most renewable energy projects. There is an expressed interest and need for both types of services in the High Country, and several key steps are needed to increase the prevalence of energy efficiency and renewable energy construction projects in the region.

- Identifying retraining opportunities/retraining the workforce
- Creating customer education/public awareness
- Offering industry education to all sectors relating to and impacting the construction sector
- Improving policy and legislation

Real estate and construction sector trends and predictions show that these areas will likely take several years to recover, but it is also important to note that these industries will almost certainly

never return to the historical levels seen in 2006 and 2007. For the above reasons, it would be reasonable to assume that some contractors and construction workers will be forced to seek employment in other industries altogether; however, retraining opportunities pertaining to energy efficiency, renewable energy, and green construction should allow some of the workforce to remain employed within the construction sector. In addition to the considerable potential for energy retrofits, weatherization, and green construction in the High Country Region's residential construction industry, there are ample opportunities for such projects within the commercial and industrial construction industries as well. Contractors and businesses previously involved in residential construction may have to retrain and transition into offering commercial services in combination with, or potentially in lieu of, their residential services. The High Country WDB already provides funding and free workshops for construction businesses and contractors wanting to obtain some form of green construction certification, including the National Association of Home Builder's Certified Green Professional. These businesses can also elect to attend workshops and certification courses on any topics relating to green construction, and the High Country WDB will provide the funding, even if that particular course is not being offered by the WDB or its partners. This asset offers local construction businesses a financially viable way to retrain their employees to enter the emerging niche market of green construction, which includes conducting energy audits, energy retrofits, and renewable energy system installations.

Creating customer awareness and public education on the benefit of green construction is another key step to revitalizing the construction sector within the High Country. Without understanding the incentives and financing structures in place for energy efficiency and renewable energy projects, potential customers are less likely to demand these types of services. Educating the buyers and the general public on different types of renewable energy systems and energy efficiency initiatives that are available in their areas should increase the demand for these services particularly as buyers become aware of the health, environmental, community, and financial benefits these projects have to offer.

Providing industry education to other key stakeholders in the construction industry such as appraisers, realtors, lenders, and insurance agents will help ensure that energy efficient and "green" homes and buildings are valued appropriately. These types of structures are worth more money than comparable buildings that do not have any "green" features. The higher value of these homes and buildings would mutually benefit both the construction and real estate sectors in addition to any other related stakeholders. This valuation would likely increase the customer demand for green construction, energy retrofits, and renewable energy projects because the higher value of these projects would justify their added initial cost. The High Country is already taking steps to close this stakeholder loop through industry education. For example, the High Country WDB, under the NC Department of Commerce State Energy Sector Partnership grant and in partnership with the Future Forward Workforce Alliance, has offered Green Valuation Specialist trainings for industry stakeholders including realtors, appraisers, lenders, insurers, and plumbers in the High Country Region and its surrounding counties and regions.

Finally and most importantly, policy and legislation, at the state and local levels will largely determine the future demand for green construction. As mentioned earlier in the report, improved interconnection and net metering rules at the local utility level will improve the viability of renewable energy projects in this region. A stricter state Building Code will greatly increase the demand for energy retrofits and green construction as well. As discussed earlier in this report, late last year the North Carolina Building Code Council voted to increase energy efficiency standards in commercial construction by 30 % and in residential construction by 15 % above the current building code standard (NCSEA News). These new requirements will take effect in early 2012 and will likely increase the demand for green construction companies in this region, particularly those that specialize in commercial projects. An even stricter code will greatly benefit the local construction sector, and requiring higher residential efficiency standards will likely provide even more economic benefit because most builders in this region specialize in custom residential construction projects. Additionally, this requirement will save area households hundreds of energy dollars each year; money that will otherwise leave the local economy and reduce each household's disposable income. Overall, addressing these four key needs will help revitalize the High Country construction sector while mutually benefiting related industries, saving citizens money, and insuring a more sustainable local economy.

Works Cited

Appalachian State University -- http://appstate.edu/
ASU Energy Center -- http://energy.appstate.edu/
Feasibility of Wind Energy for the Mountain Regions of North Carolina: A GIS Perspective -- http://energy.appstate.edu/sites/default/files/mtnwind_feasibility.pdf

ASU Renewable Energy Initiative (ASU REI) -- http://rei.appstate.edu/
Projects webpage -- http://rei.appstate.edu/pagesmith/27
ASU Office of Sustainability -- http://sustain.appstate.edu/
2011 Sustainability Yearbook -- http://sustain.appstate.edu/sites/default/files/2011%20Sustainability%20Yearbook.pdf

American Solar Energy Society -- http://www.ases.org/index.php
Koshmrl, M. (2011, July/August). "View from the states: State PV markets." Solar Today. pp. 52-53.

Blue Ridge Electric Membership Cooperative -- http://www.blueridgeemc.com/

Building Performance Engineering -- http://www.buildingperformanceengineering.com/

Duke Energy -- http://www.duke-energy.com/company.asp
Franchised Electric Utilities webpage -- http://www.duke-energy.com/power-plants/franchised.asp
Renewable & Clean Energy Initiatives Fact Sheet

EDIS: Economic Development Intelligence System -- https://edis.commerce.state.nc.us/EDIS/page1.html
Community Demographics Database, County Reports

Employment Security Commission of North Carolina -- https://www.ncesc.com/default.aspx
Labor Market Information Division -- http://www.ncesc1.com/lmi/default.asp
Quarterly Census of Employment and Wages (QCEW)

EMSI: Economic Modeling Specialists Inc. -- http://www.economicmodeling.com/

EnergyUnited Electric Membership Corporation -- http://www.energyunited.com/

French Broad Electric Membership Cooperation -- http://www.frenchbroademc.com/

International Energy Agency -- http://www.iea.org
World Energy Outlook -- http://www.worldenergyoutlook.org/
2010 Fact Sheets --

http://www.worldenergyoutlook.org/docs/weo2010/factsheets.pdf
Lawrence Livermore National Laboratory -- https://www.llnl.gov/
U.S. Energy Flowchart 2009 --
https://www.llnl.gov/news/newsreleases/2010/images/energy-flow-annotated.pdf

Lillian, J. (2011, July). "With a strong PV potential, can a solar market bloom in the deep south?"
Solar Industry, 4(6), pp. 52-56.

Lyons Construction & Realty, Inc. -- http://www.lyonsconstructionandrealty.com/

Minnesota Power -- http://www.mnpower.com/
The Pyramid of CONSERVATION, Residential Version, A Foundation in Energy Efficiency" -- http://www.mnpower.com/powerofone/one_home/index.htm

Mountain Electric Cooperative -- http://www.mountain.coop/

National Association of Home Builders (NAHB) -- http://www.nahb.org/
Smaller Homes to Remain Popular Even After Recession's End --
http://www.nahb.org/news_details.aspx?newsID=11485&fromGSA=1

New River Light & Power -- http://nrlp.appstate.edu/

The New York Times -- http://www.nytimes.com/
Times Topics, Housing (March 30, 2011) --
http://topics.nytimes.com/top/reference/timestopics/subjects/h/housing/index.html

North Carolina Department of Commerce -- http://www.nccommerce.com/
North Carolina Commission on Workforce Development --
http://www.nccommerce.com/workforce
2011 State of the Workforce Report

North Carolina Energy Division -- http://www.nccommerce.com/energy
2010 North Carolina State Energy Report

North Carolina Electric Cooperatives -- http://www.ncelectriccooperatives.com/

North Carolina Sustainable Energy Association -- http://energync.org/
2011 North Carolina Clean Energy Data Book
NC Building Code Council Approves Compromise on Energy Conservation Code --
http://energync.org/blog/ncsea-news/2010/12/14/nc-building-code-council-approves-compromise-on-energy-conservation-code/

North Carolina Solar Center -- http://www.ncsc.ncsu.edu/

DSIRE Database -- http://www.dsireusa.org/

North Carolina Utilities Commission -- http://www.ncuc.net/
2009 Report of the North Carolina Utilities Commission

Progress Energy -- https://www.progress-energy.com/
Generating Plants Brochure --
https://www.progress-energy.com/assets/www/docs/company/plantbrochure.pdf

Rutherford Electric Membership Coorporation -- http://www.remc.com/

Southern Power -- http://www.southerncompany.com/southernpower/

Surry-Yadkin Electric Membership Corporation -- http://www.syemc.com/

Tennessee Valley Authority -- http://www.tva.gov/
TVA Reservoirs and Power Plants Interactive Map --
http://www.tva.com/sites/sites_ie.htm

U.S. Bureau of Labor Statistics -- http://www.bls.gov/

U.S. Census Bureau -- http://www.census.gov/
2010 Census -- http://2010.census.gov/2010census/data/
American Community Survey -- http://www.census.gov/acs/www/
American FactFinder -- http://factfinder2.census.gov/main.html
Building Permit Stats -- http://censtats.census.gov/bldg/bldgprmt.shtml

U.S. Department of Energy -- http://www.energy.gov/
Energy Information Administration -- http://www.eia.gov/
Energy Efficiency Trends in Residential and Commercial Buildings, October 2008

National Renewable Energy Laboratory (NREL) -- http://www.nrel.gov/

Office of Energy Efficiency & Renewable Energy (EERE) -- http://www.eere.energy.gov/
Energy Savers webpage -- http://www.energysavers.gov/

U.S. Environmental Protection Agency -- http://www.epa.gov/
Power Profiler -- http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html

U.S. ZIP Code Database -- http://www.zip-codes.com/

W.A.M.Y. Community Action, Inc. -- http://www.wamycommunityaction.org/
Weatherization & H.A.R.R.P. webpage --
http://www.wamycommunityaction.org/programs/weatherization-h-a-r-r-p

Yancey Common Times Journal

"Former Micaville plant gets green retrofit grant", 03 Aug. 2011, 19(31), p.1

"Solar site planned in Pensacola as part of four-county initiative", 10 Aug. 2011, 19(32), pp.1-2