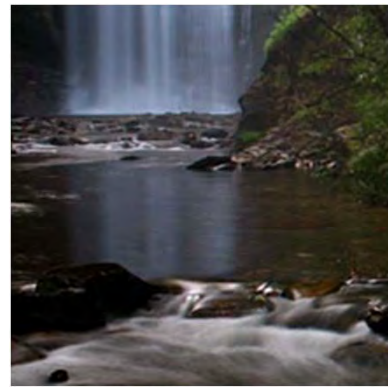
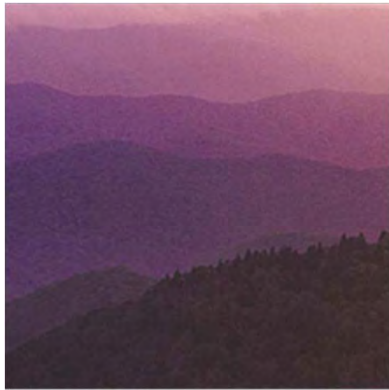


Western North Carolina

Clean Energy Cluster Analysis

Executive Summary

September 2011





Acknowledgements

AngelouEconomics would like to express our appreciation to the many individuals and organizations who contributed their invaluable input on key issues identified through the creation of this report. We would especially like to thank the project sponsors and support organizations.

Project Partners:



Funding Organizations:

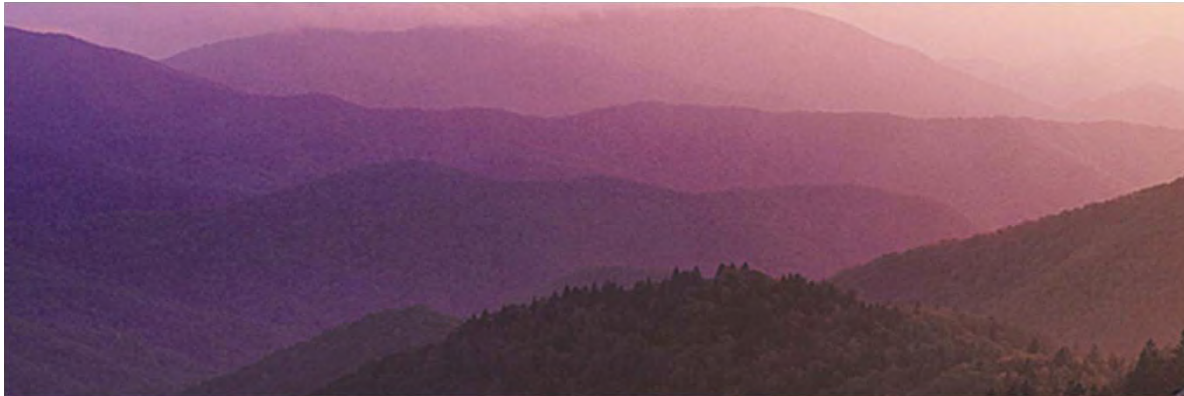
Appalachian Regional Commission

North Carolina Rural Center

United States Economic Development Administration

WNC Clean Energy Leadership Group Members:

AdvantageWest Economic Development Group
Appalachian State University/ Energy Center
Asheville-Buncombe Sustainable Communities Initiative
Asheville Area Chamber of Commerce
Asheville HUB
Biofuels Center of NC
Blue Ridge Electric Membership Corp
Blue Ridge Sustainability Institute
City of Lenoir
Duke Energy
Haywood Community College
High Country Council of Governments
Inception Micro Angel Fund/Carolina Financial Group
Isothermal Planning & Development Commission
Land-of-Sky Regional Council
Natural Capital Investment Fund (NCIF)
NC Center for Engineering Technologies
NC DENR Division of Air Quality
NC Department of Commerce
NC League of Municipalities/NC Energy Policy Council
NC Solar Center
NC Sustainable Energy Association
Northwest Piedmont Council of Governments
Office of Congressman Shuler
Progress Energy
PSNC Energy
Self-Help Credit Union
Southwestern Commission
Southwestern Workforce Development Board
Support Services Providers for WNC
Transylvania County Planning & Economic Development
UNC Asheville/RENCI/NEMAC
Unifour Air Quality Committee
Waste Reduction Partners
Western Carolina University Rapid Center
Western North Carolina Green Building Council
Western Piedmont Council of Governments



Introduction

Recognizing the opportunities that are associated with the growth of the clean energy industry and the role that it has begun to play within the regional economy of Western North Carolina (WNC), a collaboration of several key regional organizations representing 31 counties partnered in order to establish the *Building the Clean Energy Economy in Western North Carolina* project. The *Building the Clean Energy Economy in Western North Carolina* project seeks to empower WNC's public and private leadership, economic development professionals, workforce development specialists, and educational partners with data, vision, and tools to implement and grow the clean energy sector of the green economy.

As part of the initiative, project partners engaged AngelouEconomics, an economic development and site selection consultancy based in Austin, Texas, to complete an in-depth analysis of the clean energy economy of Western North Carolina. A particular focus was placed on the identification and evaluation of any potential clean energy industry cluster(s) that may be present within the region and on the recommendation of specific strategies that may be pursued in order to strengthen and grow the clean energy industry in Western North Carolina. The full analysis, findings and recommendations that resulted from the study have been assembled in the **Western North Carolina Clean Energy Cluster Analysis report**.

This report is the result of a five-phase study completed by AngelouEconomics over the course of several months. Its purpose is to assist the region in developing a deeper understanding of the current state of the clean energy industry within WNC and to provide a strategic roadmap that guides Western North Carolina in an effort to build upon the region's previous success with clean energy development and related activities and to support further growth and development of the industry within the region.



The Western North Carolina region consists of 31 counties, many of which are located along the Blue Ridge Mountains

- The 31 counties studied include the following:

Alexander	Jackson
Alleghany	Macon
Ashe	Madison
Avery	McDowell
Buncombe	Mitchell
Burke	Polk
Caldwell	Rutherford
Catawba	Stokes
Cherokee	Surry
Clay	Swain
Cleveland	Transylvania
Davie	Watauga
Forsyth	Wilkes
Graham	Yadkin
Haywood	Yancey
Henderson	

Western North Carolina Clean Energy Cluster Analysis

EXECUTIVE SUMMARY

The clean energy industry has enjoyed a very high profile among growth industries during the past several years. A high level of investment and entrepreneurship has spurred the development of new technologies and innovations that have made their way to the market delivering a balance of economic and environmental benefits. Of course, the growth and future prospects of the clean energy industry have led many communities to work to support it within their own economy; however, the emerging clean energy economy presents a tremendous opportunity for Western North Carolina (WNC) in particular. **The WNC region offers a unique mix of assets that, if properly applied, can support a highly competitive environment for clean energy businesses and enhanced economic activity.**

At the conclusion of the five-phase **Western North Carolina Clean Energy Cluster Analysis** study, the project team found that not only does Western North Carolina offer many of the elements that are critical for the support of the clean energy industry, but that a collection of clean energy industry clusters have already formed in portions of the region. Primary clean energy industry clusters were identified in Buncombe and Henderson Counties with Watauga, Davie, Forsyth, and Catawba Counties also exhibiting conditions consistent of strong secondary clusters. Overall, the region's clean energy industries were growing faster than anticipated with growth in employment and establishments outpacing industry growth in the U.S. by 4.3% and 1.3% respectively.

While Western North Carolina offers a natural base for the growth and attraction of clean energy companies, the region is not without its challenges and it will take a concerted regional effort and decisive leadership to take the region from its current position as a clean energy growth center to its potential as a national, or perhaps even international, clean energy industry hub. The following executive summary provides an overview of key findings from the Western North Carolina Clean Energy Strategic Recommendations report.

Target Clean
Energy Sectors

Renewable Energy

Energy Efficiency

Alternative Fuel and Vehicle Technologies

Western North Carolina Clean Energy Cluster Analysis EXECUTIVE SUMMARY

PUBLIC INPUT GOALS AND CONCERNS

In order to ensure that the analysis associated with the study addressed key concerns and priorities of the region, the project team worked with community and industry stakeholders to identify issues that might have a significant bearing on the study's final recommendations. Several prevalent themes of key interest to WNC stakeholders were identified through the many interviews and focus groups that were conducted for this study. They include the following:

1. Identifying an organization that can lead the region's clean energy strategy and initiatives.
2. Acting more as a region in order to become a recognized center for the clean energy industry.
3. Taking action now on efforts to grow the clean energy economy in Western North Carolina, rather than waiting to act further into the future.
4. Seeking opportunities for urban *and* rural parts of the region to take part in the growth and development of Western North Carolina's clean energy industry.
5. Addressing concerns regarding a weakened commitment from the State to the support of the clean energy industry and the possibility that North Carolina's REPS standards do not go far enough.
6. Generating new jobs in the region that can help it to emerge from the challenges of an impacted manufacturing base.
7. Making the region a more attractive destination for working professionals.
8. Tapping into the region's strong creative class in order to emerge as an innovator and a recognized national leader in the clean energy industry.
9. Working more collaboratively between institutions and coordinating the region's clean energy initiatives and other economic development efforts.

AngelouEconomics Project Phases



Western North Carolina Clean Energy Cluster Analysis

EXECUTIVE SUMMARY

BUILDING A CLUSTER ON STRONG REGIONAL INSTITUTIONS AND NATURAL ASSETS

It was found through the course of analysis that the Western North Carolina region offers strong conditions for the support of clean energy companies (and related enterprises) and numerous assets that may be leveraged in order to expand upon the region's already competitive position in the industry.

Western North Carolina possesses numerous key institutions and resources that could support the growth of the clean energy industry. The WNC region is home to several highly capable and reputable universities that maintain programs supportive of the clean energy industry, and is also home to a strong collection of community colleges, the National Climatic Data Center, AdvantageGreen, ASU Energy Center, and many others. The combination of these assets, as well as the activities they currently support, place WNC in a very strong position to sustain further development of a clean energy industry cluster. **While many regions throughout the United States offer some of these assets or others that might allow them support a particular area of the industry, few regions, particularly within the Southeastern U.S., offer the unique combination of clean energy assets that are found in Western North Carolina.**

Western North Carolina offers strong resources for the development of the solar industry, as demonstrated by Buncombe County, who features one of the states leading clusters of solar installations. Other factors determining suitability besides solar resources include access to required infrastructure, proximity to markets and suppliers, the presence and support of key institutions, and access to a skilled workforce.

Western North Carolina features several locations that offer high amounts of wind resources (Class 4 and above), particularly along the top of the Blue Ridge Mountains. However, the utilization of these resources for energy production is challenged by several factors that may prevent, limit or delay the installation of wind infrastructure.

Western North Carolina has access to abundant biomass resources available throughout the region. Access to significant biomass resources can often determine the appropriateness of certain related clean energy activities within a region. Landfills, forest and primary mill residue offer the highest amounts of biomass within the region.

Western North Carolina is already utilizing many of its existing landfills for recapturing methane gas. Methane recapture for the purposes of producing energy is an emerging portion of the clean energy industry for which WNC has a particular aptitude. With 46% of North Carolina landfills currently recapturing methane located within Western North Carolina, the region is in a strong position to expand its leadership in this portion of the industry .

Western North Carolina Clean Energy Cluster Analysis EXECUTIVE SUMMARY

CURRENT / POTENTIAL WNC CLEAN ENERGY CLUSTERS

Completing an analysis of regional growth trends, resource availability and industry development patterns served as a base for the project team in evaluating Western North Carolina's clean energy clusters. This, in combination with an examination of the region's labor force and clean energy supply chain, facilitated the development of recommended strategies for building upon these clusters in support of the region's clean energy industry.

The Western North Carolina region has begun to develop a "hub-and-spoke" pattern of clean energy clustering, with the Asheville metropolitan area at its center as the region's most substantial clean energy industry cluster. Secondary clusters can be found in Watauga County near Appalachian State University, Davie and Forsyth Counties, and Catawba County.

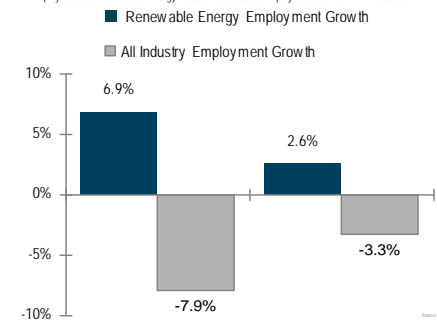
- Buncombe / Henderson Counties
- Watauga County
- Davie / Forsyth Counties
- Catawba County

It is likewise important to acknowledge that the strength of WNC's clean energy clusters may be supported by the success of the industry and its suppliers in other portions of the region, and that with stronger linkages built between these clusters, they may act collectively as a regional economic network of clean energy clusters. It is by supporting a strong network of clean energy clusters and by taking a regional approach to the development of the industry that Western North Carolina might be able to become a national hub for the clean energy industry.

Employment and establishment growth patterns confirm findings in interviews and focus groups of likely locations for emerging clean energy clusters. **Growth in employment and number of establishments in industries relating to clean energy within Western North Carolina has outpaced industry growth in the U.S. as a whole by 4.3% and 1.3% respectively.** Despite the harsh recessionary conditions affecting North Carolina and the United States as a whole, the WNC region saw growth in industries that relate to or may support clean energy.

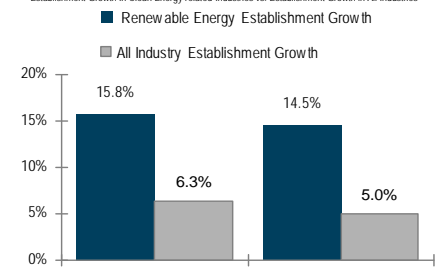
EMPLOYMENT GROWTH (2005 – 2009)

Employment Growth in Clean Energy-related Industries vs. Employment Growth in All Industries



ESTABLISHMENT GROWTH (2005 – 2009)

Establishment Growth in Clean Energy-related Industries vs. Establishment Growth in All Industries



EXECUTIVE SUMMARY

WNC CLEAN ENERGY LABOR FORCE

In order to determine Western North Carolina's ability to support the clean energy industry, the project team completed an analysis of the region's labor force that provided insight into the unique strengths and challenges that currently affect WNC. The findings of this analysis as highlighted below indicate that Western North Carolina offers a competitive workforce, however the region holds an insufficient number of engineers.

Strong Manufacturing Heritage

WNC maintains a strong heritage in manufacturing which may be helpful to the region as it continues to build its clean energy industry. Although not all segments of the clean energy industry rely on manufacturing, this presents a competitive advantage for the region in supporting the growth of the industry.

Competitive Wages

Wages in those occupations that are key to the clean energy industry are lower in WNC than in the nation as a whole. This competitive position on wages makes the region a more attractive location to operate a clean energy business.

Regional Shortage of Engineers

When compared to the nation as a whole, Western North Carolina is challenged by a shortage of engineers, particularly those with advanced degrees. Although certain portions of the region may offer better access to engineers than others, the region is lacking the highly-educated and highly-skilled engineers that can be so crucial to the growth and development of the clean energy industry. One possible factor that may be contributing to this is the structure of advanced engineering programs in the region's universities. Although several colleges and universities in WNC offer students an education in engineering, several that offer 3-2 programs in engineering (which generally consist of combined Bachelors and Masters studies) in partnership with other universities are structured in such a way that engineering students are led out of the region. This is due to the programs being designed such that students begin their studies in Western North Carolina but complete their studies in a university outside of the region or, in some cases, outside of the state. While providing many students access to an education that might not otherwise be available, these one-way partnerships may be leading the region's young engineers to set root in another region upon graduation and may therefore be draining WNC of its future engineering talent.

EXECUTIVE SUMMARY

OPPORTUNITIES AND CHALLENGES FACING THE REGION

Upon completion of the research and analysis associated with this study, a broad set of regional strengths and concerns were identified that have and will continue to shape efforts to develop the clean energy industry within Western North Carolina. These issues, reflecting the unique characteristics of the WNC region, served as a framework for the identification of goals and strategies that will help the region to grow and strengthen its economy and to solidify its position as an emerging center of clean energy activity. Among the challenges and opportunities that emerged throughout the course of analysis, several key issues surfaced which tended to cut across all areas of consideration and which are most likely to impact the region's efforts going forward. These include:

- Numerous clean energy assets that may be leveraged to support the development of a clean energy hub of national, and perhaps international, significance.
- A clear clean energy cluster is emerging within the region and shows significant potential for future growth and development.
- A highly independent, resourceful and entrepreneurial culture that must expand its focus toward serving markets beyond the WNC region.
- A capable workforce with a rich heritage of manufacturing, but with a significant need for highly-skilled engineers with advanced degrees.
- A challenging job market with few options for young professionals, part-time or unsuccessful entrepreneurs and relocating spouses to turn to when in need of steady employment.
- Numerous organizations throughout the region that are active in economic development and initiatives to support the clean energy industry, but insufficient coordination of activities between these organizations and a lack of a designated leader for the development and growth of a regional clean energy cluster.

Western North Carolina Clean Energy Cluster Analysis

EXECUTIVE SUMMARY

TARGET INDUSTRY NICHES

In order to sharpen the focus of regional organizations that are invested in the development of a strong clean energy cluster, several niches within the clean energy industry have been recommended as suitable targets for the Western North Carolina region.

The target niches recommended as part of this strategy were selected based on the specific characteristics of the WNC region and its capacity to support various parts of the clean energy industry. Target industry niches that stand as particularly strong opportunities for the region have been presented in the table at right. The targets identified are the result of stakeholder input, numerous interviews and focus groups, as well as the cluster, supply chain and SWOT analyses conducted as part of this study.

Each target niche listed draws upon particular assets or conditions that are found within Western North Carolina that create favorable conditions for its growth or attraction. Many of these niches draw upon the same assets, particularly the presence of certain labor resources, institutions or markets, and while it may be best to focus the region's attention and resources on a more limited set of target niches, it is also important to recognize that several additional segments of the industry may be well-suited to the region. Therefore, leaders within the region should ensure that other possible targets are kept "on the radar," and that future marketing and policy initiatives appeal to and do not exclude these other possible targets.

Top WNC Clean Energy Target Niches

MARKET SEGMENTS	TARGET NICHES
Renewable Energy	<ul style="list-style-type: none"> • Renewable energy product testing • Printed circuit board assembly • Small-scale wind energy • Solar frame manufacturing
Energy Efficiency	<ul style="list-style-type: none"> • Electronic monitoring (including software and hardware) • Energy efficiency equipment service and maintenance • Energy efficiency instrumentation products • Solar hot water • Hot water tank manufacturing (metal fabrication)
Alternative Fuels and Vehicle Technologies	<ul style="list-style-type: none"> • Waste vegetable oil conversion equipment design and manufacturing • Commercial and passenger vehicle equipment and supplies design, manufacturing and distribution (relating to fuel efficiency, electric power systems and charging stations, and other alternative fuel technologies) • Methane recapture equipment and services • Commercial and passenger vehicle equipment and supplies manufacturing and distribution (relating to fuel efficiency, electric power systems and other alternative fuel technologies)

EXECUTIVE SUMMARY

STRATEGIC GOALS

Drawing upon the study's analysis of the region's clean energy clusters, industry assets, labor force and supply chain, the **Western North Carolina Clean Energy Strategic Recommendations** report offers a set of goals, strategies and key economic development initiatives meant to leverage the region's clean energy assets, address economic challenges and support the attraction of target niches within the clean energy industry. Recommendations are organized around the following seven goal areas each of which are key to the development of a strong clean energy industry cluster in Western North Carolina. The seven goals highlighted below are rooted in the unique conditions found within the WNC region and offer a clear path forward as the region continues its efforts to support a prosperous clean energy economy.

Goal 1: Think Globally, Act Regionally.

Goal 2: Strengthen Primary Clusters and Engage Rural Communities.

Goal 3: Expand and Reinforce Entrepreneurial Culture and Support System.

Goal 4: Leverage Western North Carolina's Natural, Institutional and Cultural Assets to Promote Opportunities in Clean Energy.

Goal 5: Foster Increased Inter-institutional Cooperation Focused on Clean Energy Technologies and Market Development.

Goal 6: Attract, Train and Retain Educated Professionals Necessary for the Support and Expansion of the Clean Energy Industry.

Goal 7: Aggressively Pursue New Business Opportunities

EXECUTIVE SUMMARY

15 TOP PRIORITY STRATEGIES FOR THE SUPPORT OF A CLEAN ENERGY CLUSTER IN WESTERN NORTH CAROLINA

In order to assist the WNC region in fulfilling its clean energy economic development goals, a detailed set of strategies have been developed and presented in the **Western North Carolina Clean Energy Strategic Recommendations** report. Of the more than forty individual strategies and initiatives that are recommended within the report, fifteen that should receive top priority are highlighted below.

1	Designate a regional organization to lead Western North Carolina's clean energy cluster development and promotional efforts.
2	Clarify and formalize roles and responsibilities of local / county economic developers and other key institutions in the development and promotion of the clean energy industry in Western North Carolina.
3	Develop a unified regional brand that incorporates the region's distinct clean energy clusters and surrounding rural assets.
4	Recognize and market the region's clean energy clusters.
5	Reinforce existing and emerging clean energy clusters and link each to one another for enhanced diversification and growth.
6	Encourage training or recruitment of critical clean energy occupations, especially engineers.
7	Adapt and exchange clean energy lessons and resources between rural and urban communities.
8	Encourage and support WNC clean energy entrepreneurs to seek business opportunities in markets outside of the Western North Carolina region.

EXECUTIVE SUMMARY

15 TOP PRIORITY STRATEGIES FOR THE SUPPORT OF A CLEAN ENERGY CLUSTER IN WESTERN NORTH CAROLINA

9	Communicate success stories of WNC clean energy entrepreneurs within and outside of the region.
10	Establish a dual-campus Clean Energy Product Testing Center.
11	Establish a non-profit multidisciplinary research institute that serves as a platform to support clean energy researchers from universities, government agencies, non-profits and private industry.
12	Establish a globally-oriented policy and industry forum focused on the key clean energy challenges and opportunities of the day, and institute an annual meeting of top clean energy leaders and stakeholders.
13	Tie the region's emergence as a center for the clean energy industry in with other more widely recognized regional industries, including art, tourism and outdoor recreation.
14	Enhance the promotion and coordination of existing clean energy industry skills training programs available in Western North Carolina.
15	Explore and pursue international opportunities relating to the clean energy industry.

Western North Carolina Clean Energy Cluster Analysis

EXECUTIVE SUMMARY

IMPLEMENTATION

The measure of any successful strategy is found in its implementation. With this in mind, the project team has provided several resources that will serve as key tools in the implementation of all recommendations. These include an implementation matrix, specific companies that may be targeted, and the performance metrics below.

CONCLUSION

During a period when so many communities throughout the United States and abroad are eagerly pursuing efforts to build or attract a clean energy presence, the 31-county region of Western North Carolina is in an enviable position with the ability to emerge in the coming years as a recognized hub for the industry. In addition to significant environmental resources and natural beauty, the WNC region offers a unique mix of assets that, if properly applied, can support a highly competitive environment for clean energy businesses and enhanced economic activity.

However, the path forward is not without its challenges and success will require a broad regional effort with clear and decisive leadership. To be successful, the Western North Carolina region will require the use of its two most valuable resources: a resolute sense of commitment and independence and an authentic spirit of creativity and initiative.

PROJECT CONTACT INFORMATION:

Land-of-Sky Regional Council
Patrick Harper, Clean Energy Regional Planner
(828) 251-6622
patrick@landofsky.org
www.CleanEnergyWNC.org

AdvantageWest Economic Development Group
Matt Raker, VP of Entrepreneurship & AdvantageGreen
828-687-7234
mraker@awnc.org
www.AdvantageWest.com

CONSULTING FIRM CONTACT INFORMATION:

AngelouEconomics
(512) 225-9322
8121 Bee Cave Road, Suite 200
Austin, Texas 78746
www.angeloueconomics.com