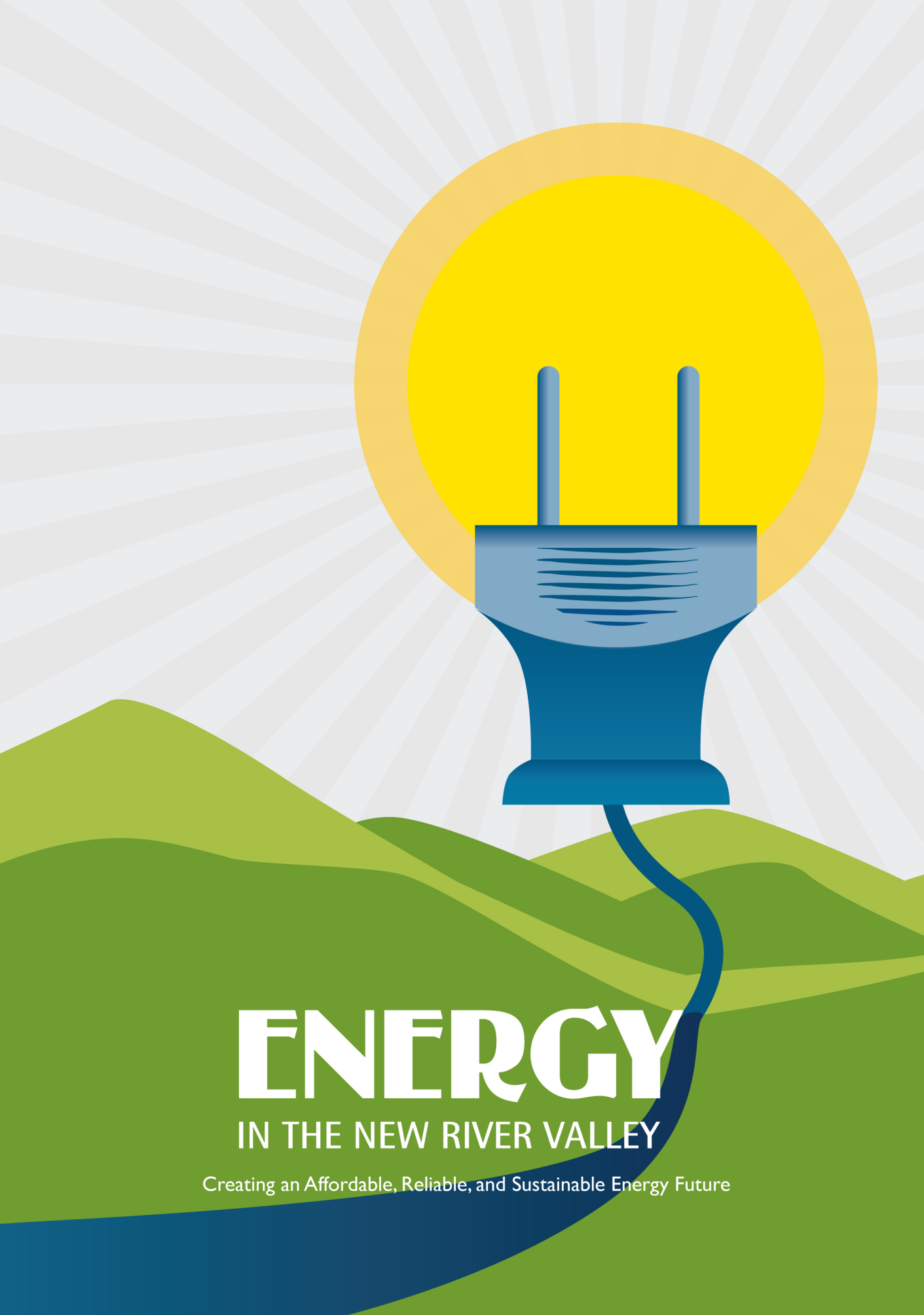
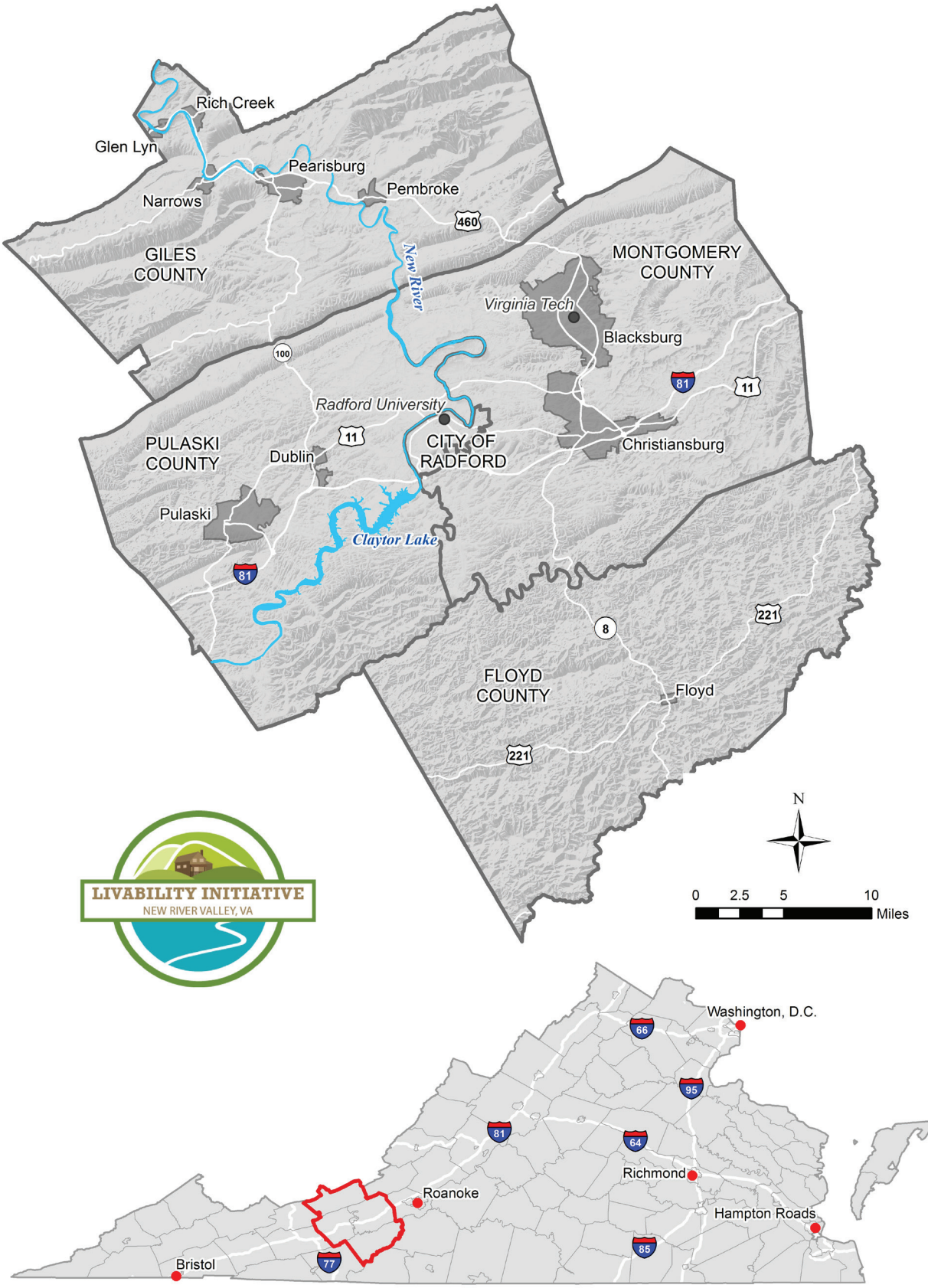

ENERGY
IN THE NEW RIVER VALLEY
Creating an Affordable, Reliable, and Sustainable Energy Future

Energy in the New River Valley

Creating an Affordable, Reliable, and Sustainable Energy Future

New River Valley, Virginia



CONTENTS

INTRODUCTION

Nearly every aspect of New River Valley (NRV) residents' lives is impacted by energy. It warms homes, fuels vehicles, runs businesses, enables communication across distances, and plays an important role in producing and transporting food. In order to ensure that the NRV continues to be prosperous and resilient, active steps need to be taken to ensure the region's access to affordable, reliable and sustainable energy options tomorrow and decades into the future. To do this, it is important to take stock of the significant challenges ahead. Now is the time to meet those challenges head on and to recognize the opportunities the region has to transform its energy systems, making the wisest possible choices for the long-term health and well-being of NRV communities.

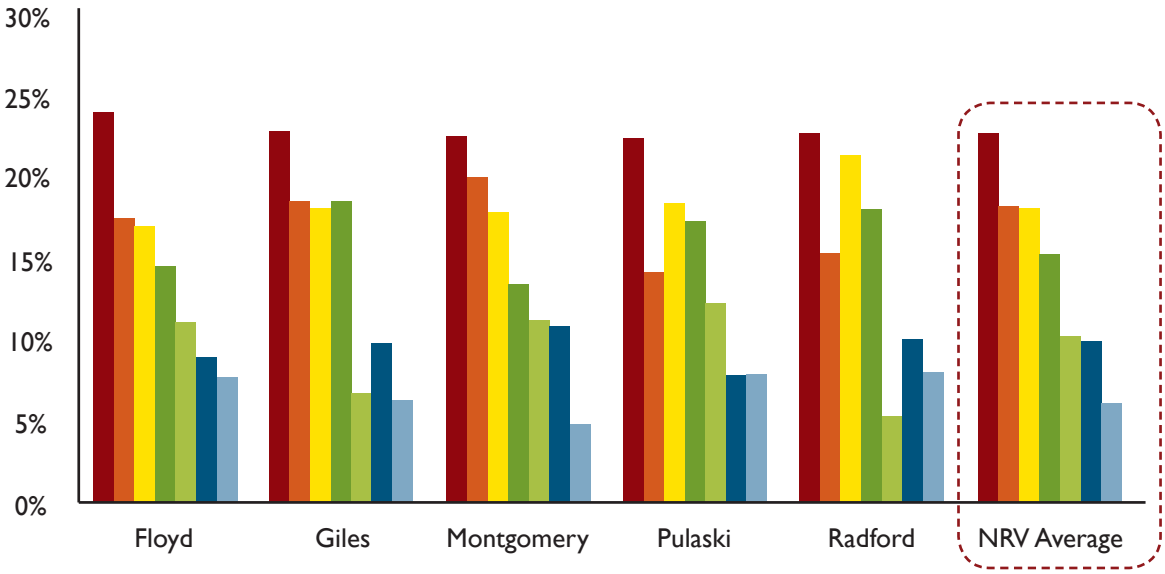
For decades, Virginia and the New River Valley enjoyed extraordinarily low energy prices, and only in recent years have electricity rates caught up with the national average. While energy prices were low, there was little incentive for households or businesses to be aware of their energy consumption, much less take active steps to reduce energy waste or increase energy efficiency of their homes or buildings. Increasingly, households and businesses are realizing the cost-effectiveness of energy efficiency improvements that can reduce energy expenditures, retain local dollars, and reduce the environmental effects of energy use. Because of its educational, research, and training expertise; its local public, private, and non-profit institutions; and its entrepreneurial spirit, the NRV is very well positioned to take advantage of this opportunity to advance a local clean energy economy and serve the larger region. To do so may require developing strategic partnerships, attracting private investment, and advocating for more effective statewide clean energy policies.

Energy & The Livability Initiative

Energy in the New River Valley is a product of the NRV Livability Initiative's three-year regional planning process. In December 2012, the Livability Initiative conducted a Community Priorities Survey, which sought citizen feedback on the proposed goals developed from public input during earlier phases of outreach and on a set of topic area goals resulting from research and discussion on the part of seven working groups. The purpose of this survey was to better understand how citizens in the region would prioritize the draft goals identified to date. Although priorities varied some for individual localities, the top three NRV-wide energy priorities identified through this process were:

1. **Energy Efficiency and Conservation** – Energy use (and therefore cost) is reduced in households, businesses, institutions, and municipalities through efficiency and conservation.
2. **Environmental Stewardship** – Negative impacts of energy production and consumption (air and water pollution, transportation emissions, land consumption, etc.) are reduced.
3. **Transportation Options and Efficiency** – Expanded and/or improved transportation choices reduce household expenses and improve air quality.

Citizen Energy Priorities - Top Energy Goals by Locality



** NRV Livability Initiative Community Priorities Survey, January 2013*

The Regional Energy Plan

The Regional Energy Plan provides a framework for the New River Valley to prepare for the future and lead Southwest Virginia to affordable clean energy over the next 10-20 years. It describes the current energy supply and consumption patterns of the region and suggests that the NRV needs to prepare for this future of more costly conventional energy by investing in energy efficiency improvements and development of local energy sources. The Plan is framed around eight Principles, the product of a year-long discussion by NRV Livability Initiative's Energy Working Group and other Livability Initiative public involvement surveys and stakeholder meetings.

The full Regional Energy Plan can be found on the NRV Livability website in the "Resources" section: http://www.nrvlivability.org/content/resources.

In this Report

Energy in the New River Valley is a summary report that provides the key findings, strategies, and recommendations of the Regional Energy Plan. It emphasizes local economic development of energy services and training, preserving lifestyle choices, energy efficiency improvements, local renewable energy development, and strategic partnerships to create a culture of clean energy by adopting policies and programs that reduce barriers and promote implementation of key strategies.

- Energy Efficency & Conservation
- Transportation Options & Efficiency
- Energy Reliability
- Renewable & Alternative Energy
- Public Policy: Supporting Local/Renewable Energy
- Public Policy: Supporting Traditional Energy

PRINCIPLE 01

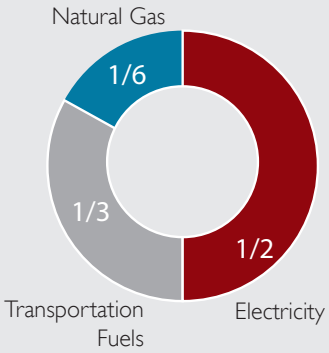
Position the New River Valley Economy for an Affordable, Reliable, and Sustainable Energy Future

New River Valley residents are paying (and will continue to pay) more for the energy they use, and most of what they spend leaves the region almost immediately instead of benefiting the local economy.

Energy drives the New River Valley economy, and long-term economic viability depends on affordable, reliable, and sustainable sources of energy. **Currently, the NRV spends about $500 million on energy each year, an increase of more than 50% since 2005. Nearly 1/2 of these expenditures are for electricity, about 1/3 are for transportation fuels, and 1/6 are for natural gas.**[1] Although the region's energy consumption has remained relatively constant for the past 5-10 years, energy prices, with the exception of natural gas, have increased significantly. For example, while residential electricity use only increased 16% from January-May for 2013, compared to the same period in 2012, expenditures increased 27%. That equates to a $270 increase on a $1000 winter electricity bill – $160 of which can be attributed to the colder weather in 2013 and $110 to higher electricity rates.[2] With electricity being the dominant heating source for NRV residents, this increase in cost has large impacts.

Market forces and environmental protection imperatives will likely cause both coal- and petroleum-based energy prices to increase in the future. This will make the current rise in energy costs even more dramatic in coming years, raising major concerns about the affordability of the region's energy. Recent weather-related power outages have also highlighted the need to re-examine the overall reliability and resilience of the NRV's energy grid. Much has already been done by local utility companies to lessen the impacts of these outages. However, further improvements are needed to decrease the duration and frequency of weather-related and other power interruptions and to better manage the growth in daily **peak energy demand.**

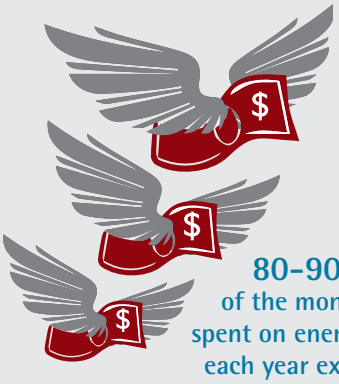
NRV Energy Spending Each Year



$500 MILLION (up 50% over 2005)

definition

"Peak Energy Demand" refers to a time period, typically during the day, in which customer electricity use is at its highest. Peak Energy Demand is also impacted by seasonal variation. The New River Valley is typically a "winter peak" community, meaning that because of its heavy reliance on electric heating, it tends to have the highest peak demand during the coldest months of the year. Managing peak energy demand – or shifting some of the demand off-peak – helps manage power loads and system capacity and prevents outages during unanticipated peak demand episodes (i.e. extreme heat wave/ cold snap).



80–90% of the money spent on energy each year exits the region immediately.

Eighty to ninety percent of the money spent on energy each year exits the region immediately, which means that it is not available to generate further local economic activity or employment opportunities. It is quite literally money that goes "up in smoke," which could be better spent helping local families cover other household expenses and supporting local jobs and businesses. Most of the NRV's electricity, coal, liquid fuels, and natural gas originate outside the region, so dollars spent on these sources end up supporting the communities where the energy is extracted, processed, generated, and transported. Local energy production in the NRV is limited to utility hydroelectric facilities, residential wood fuel use, and a few small on-site solar systems.

Economic Development Opportunity Lost

A June 2013 "Clean Energy in the Mountains" conference highlighted Asheville, North Carolina's efforts to advance clean energy and how it has helped economic development. One of Asheville's newest businesses, the Sierra Nevada Brewery, was once considering Christiansburg as a potential site. The company chose Asheville over Christiansburg based on a number of factors, but the company said that western North Carolina's "focus on green technologies played a role in luring the business to decide to invest $107.5 million into its new brewery there" (Mountain Express, 2013).

Although energy production is not currently a major component of the NRV's economy, several utilities, fuel suppliers, and energy equipment sales and service providers employ hundreds of people and supply critical energy and related equipment and services to the region. Additionally, an energy equipment and service sector focused on efficiency and sustainable energy has been expanding in the NRV over the past 10 years. **Studies have shown that a far greater percentage of dollars spent on local energy services remain in the community and have a greater economic multiplier effect than dollars spent on imported fuels and electricity.[3] Local energy efficiency services and source development efforts, therefore, not only lower consumers' energy bills, but also contribute to economic development and job creation throughout the region.**

** Modeled after Mackres, 2012*

What communities can do to position the New River Valley economy for an affordable, reliable, and sustainable energy future:

STRATEGIES 01

one

Reduce growth of energy expenditures and impacts on households to improve overall housing affordability and retain energy dollars for local purchases and investment.

- Develop transportation and land use options that reduce vehicle dependence (see Principles 2 & 3).
- Expand residential and commercial building efficiency programs (see Principle 5).

two

Enhance energy reliability through improved infrastructure and local distributed energy sources.

- Encourage neighborhood-, farm-, campus-, commercial- and community-scaled distributed energy production.
- Provide information and resources to consumers to manage peak energy demand.
- Develop and coordinate contingency plans for energy supply disruptions.

three

Make the NRV the clean energy center of Southwest Virginia to develop the local economy, attract new businesses, and increase the region's competitiveness in the future clean energy economy.

- Develop the technical and business expertise needed to expand energy efficiency in buildings.
- Use regional colleges, universities, and workforce development assets to expand education, training and research around clean energy.
- Develop consumer understanding of the economic cost-effectiveness and environmental and social benefits of clean energy improvements in the region.
- Attract capital to develop and implement clean energy technologies.

definition

"Distributed Energy Production" refers to relatively small generating units at or near consumer sites to meet specific customer needs, to support economic operation of the existing power distribution grid, or both. Reliability of service, power quality, and reduced transmission losses are enhanced by proximity to the customer, and in case of on-site combined heat and power (CHP) systems, efficiency is improved by using the heat from power generation. Some examples of this type of energy production include: solar thermal and photovoltaic systems, wind turbines, combined heat and power systems, district energy systems, biomass-based thermal and electric generating systems, natural gas combustion turbines, fuel cells, and energy storage technologies.

definition

"Clean Energy Technologies" include efficiency improvements, renewable energy development, electric vehicle charging infrastructure, smart grids, energy storage, and other technologies.

1. Randolph, J. (2013). New River Valley Regional Energy Plan: Technical Report.
2. Randolph, J. (2013). New River Valley Regional Energy Plan: Technical Report.
3. Mackres, E. (2012). Energy Efficiency and Economic Opportunity. ACEEE. Retrieved from www.aceee.org/blog/2012/09/energy-efficiency-and-economic-opport

PRINCIPLE 02

Help Preserve Rural Living Choices through Energy Improvements

Rural and low-income residents are more vulnerable to the New River Valley's rising energy prices, but the region's rural land offers great potential for addressing this vulnerability.

The New River Valley is proud of its natural beauty, peaceful surroundings, and neighborly way of life. Many came to the region for its rural character and feel that it is important to preserve this lifestyle for the future. Unfortunately, this lifestyle often comes with a large energy price tag, especially for low-income and elderly residents living in older, less efficient homes with longer travel distances to jobs and services.

Nationally, it is estimated that very low-income households (<$10,000 per year) spent 75% of their income on energy in 2013, almost half of which is for residential heating and electricity and the rest for transportation fuels.[1]

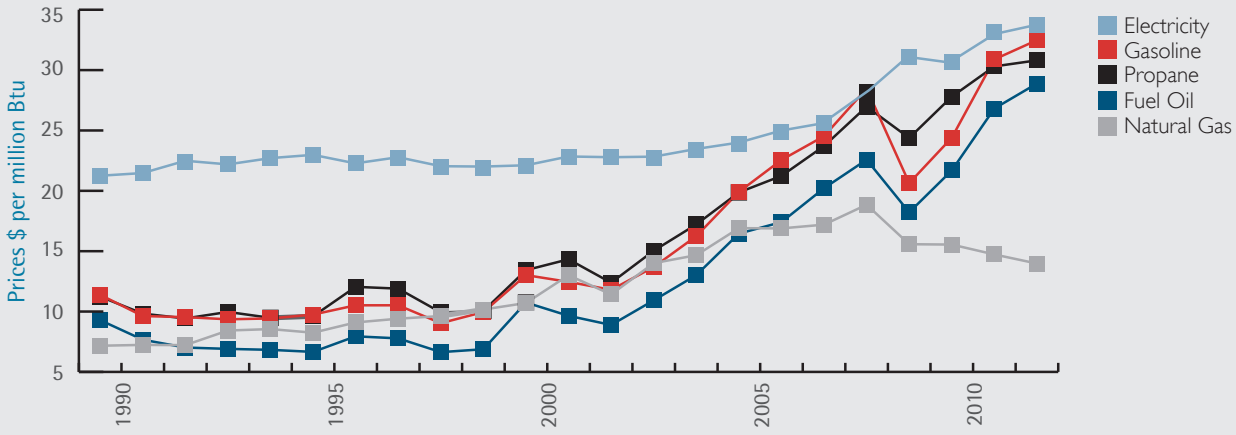
PERCENTAGE OF HOUSEHOLD INCOME SPENT ON ENERGY

(By Annual Income Level, 2013)

In the NRV, this situation is made worse for rural households that are outside lower-cost natural gas service areas and are generally dependent on more expensive fuel types: **electricity, fuel oil, and propane for heating.** Many choose to heat their homes with wood, an affordable choice especially for those who have a wood source on their property and can haul and split their own. However, the region's older residents may find it increasingly difficult to manage the physical demands of acquiring firewood and managing a woodstove. In addition, older homes in rural areas tend to be less energy efficient, and many are in need of energy efficiency improvements such as air leakage sealing, insulation, and HVAC upgrades.

COMPARISON OF VIRGINIA RESIDENTIAL FUEL PRICES

(Prices $ per million Btu, 1990-2012)



*Energy Information Administration

PERCENTAGE OF WORKERS COMMUTING OUT OF COUNTY FOR WORK

	2010
FLOYD	55.9%
GILES	63.3%
MONTGOMERY	31.7%
PULASKI	53.6%
RADFORD	54.2%

**NRV Planning District Commission, 2012*

Rural residents are also highly dependent on private vehicles for transportation and generally have longer travel distances to employment, education, commerce, medical facilities, recreation, and daily services. **More than half of Floyd, Giles, Pulaski, and Radford workers commute out of their home county for work. Furthermore, workers earning less than $15,000 per year commute an average of 26 miles more per day than those earning $40,000 or more.**[2] While alternative transportation options in the NRV are limited, especially for rural residents, ride-sharing, vanpooling, and public transit opportunities do exist and can help to reduce travel costs.

Workers earning less than $15,000 per year commute an average of 26 miles more per day than those earning $40,000 or more.

Regional Alternative Transportation Options

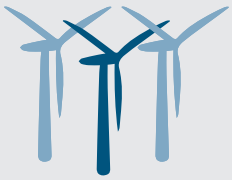
The NRV Planning District Commission's "RIDE Solutions" program provides commuting options and a car-pool matching service for the region's commuters. Some large employers, such as Virginia Tech, offer a number of alternative transportation options for commuters, including a vanpooling program that currently operates three vanpools from Pulaski, Rich Creek, and Roanoke. Also, transit options are reaching more areas in the region, with Blacksburg Transit extending service to Christiansburg, and Radford Transit servicing Fairlawn and other transportation nodes. The SmartWay Bus provides commuting options between Blacksburg, Christiansburg, and Roanoke, with a link to rail service in Lynchburg. Finally, the MegaBus stop at Falling Branch in Christiansburg offers a very affordable express link for travelers to Washington, DC and Knoxville.

definition

"Solar Photovoltaic Systems" use specialized equipment to convert sunlight into electricity.

definition

"Wind Energy Systems" use specialized equipment to convert wind into electricity.



definition

"Biomass Renewable Energy" refers to the use of organic matter to generate usable energy (i.e. electricity, biofuel for transportation, etc.).

While rural living does present many challenges, these areas are land-rich and offer potential for farm-based renewable energy systems, which could help address some of the region's energy gaps. There is significant potential for ground- and barn-roof-mounted **solar photovoltaic (PV)** systems, and some ridgetops found on rural properties offer promising potential for **wind energy systems**. **Biomass renewable energy** sources have all been produced in the NRV, including forest and crop residues, harvested wood and switchgrass, biodigesters that convert animal wastes to usable methane, and processed bioethanol and biodiesel. Unfortunately, except for wood heating fuel, there is currently very little demand for these locally produced biomass fuels. Geothermal or ground-source heat pumps have become increasingly popular in the NRV. These systems involve underground heat exchanger lines in horizontal trenches or vertical wells that use the ground as a heat source in winter and heat sink in summer, increasing overall heat pump efficiency by as much as 50%.

Agricultural Net-Metering

The 2013 Virginia General Assembly authorized agricultural-based renewable systems (HB 1695) and required that the State Corporation Commission establish a net-energy-metering program for eligible agricultural customers. This law states that agricultural net-metering will allow a customer operating a solar, wind, aerobic or anaerobic digester gas facility of up to 500 kilowatts as part of an agricultural business to be served by multiple meters that are located at separate but touching sites, provided the generating facility is located on land owned or controlled by the agricultural business and is used to provide energy to metered accounts of the agricultural business.

What communities can do to help preserve rural living choices through energy improvements:

STRATEGIES 02

one

Improve rural building efficiency to reduce energy expenditures.

- Target rural residential retrofit programs to older, less efficient homes and/or those dependent on **expensive fuel types**.
- Target rural residential retrofit programs to more vulnerable, low-income and elderly homeowners.
  (See Principle 5 for more on building retrofits.)

two

Provide mobility improvement options for rural residents.

- Periodically assess rural mobility options to identify current and emerging transportation needs.
- Develop education and outreach programs to improve understanding of the range of rural transportation options.
- Enhance and expand rural transportation options.

three

Develop rural- and farm-based renewable energy production.

- Inventory existing rural and farm-based energy production.
- Work with landowners and agriculture businesses to identify and develop potential renewable energy projects.

definition

More **expensive fuel types** tend to be electricity, fuel oil, and propane.

1. Trisko, E. (2013). Energy Cost Impacts on American Families. Retrieved from www.americaspower.org/sites/default/files/Trisko%202013.pdf
2. New River Planning District Commission. (2012). NRV Livability Initiative, Interim Report. Retrieved from www.nrvlivability.org/news/livability-initiative-interim-report

PRINCIPLE

03

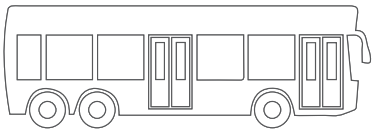
Enhance Livability and Efficiency of Town and Village Living

The New River Valley has a legacy of energy inefficient buildings, land use, and transportation systems.

Most of the region's residents live in or near towns and villages. Regarding energy use and cost, these households have advantages over rural residents as many are in natural gas service areas with lower-cost heating fuel, have shorter travel distances to work and other activities, and have more access to public transit. Still, there are opportunities to improve building efficiency and reduce energy costs, enhance mobility options, and develop building- and community-scale renewable energy projects, all of which help create more livable and affordable communities.

As in rural areas, one of the main opportunities in towns and villages for improving the region's energy efficiency is in buildings – improving the efficiency of existing housing and commercial buildings through retrofit projects and going beyond the minimum state energy efficiency requirements for new construction, all of which is addressed in detail under Principle 5.

There are also significant opportunities for encouraging more efficient transportation near the region's town and village centers. Current access to multi-modal transit is limited in the NRV. There are four public transit service operators that are based in the New River Valley: Blacksburg Transit, Radford Transit, Pulaski Area Transit, and Community Transit, which is run by the NRV Community Services Board. Each is responsible for operating various services within the New River Valley, but because the universities make substantial contributions to the public transportation system, many of their routes cater to student schedules and preferred destinations rather than those of the general public, ensuring that most non-students are highly car dependent to get where they need to go on a daily basis.



Some local governments in the New River Valley are beginning to address these transportation challenges by rethinking development patterns near town and village centers. **The combination of mixed-use development and increased density shortens travel distances and commute times while fostering a more walkable, bike-friendly community with greater access to public transit and reduced car dependency.** Per capita, communities with these characteristics tend to have significantly lower vehicle-related emissions, obesity rates, and household transportation costs. This type of development has become increasingly popular, not just for the potential environmental benefits but also for the positive and measurable social and community outcomes.

definition

"Mixed-Use Development" is development that blends residential, commercial, cultural, institutional, and where appropriate, industrial uses. Mixed-use development allows for greater housing variety and density; reduces distances between housing, workplaces, retail businesses, and other destinations; encourages more compact development; strengthens neighborhood character; and promotes pedestrian and bicycle friendly environments.

**The American Planning Association: www.planning.org/nationalcenters/health/mixedusedevelopment.htm*

"Density" is the amount of development within a given area.

**The American Planning Association: www.planning.org/pas/quicknotes/pdf/QN12.pdf*

5 Ds

The **five "Ds"** of efficient land use near town and village centers:

Density: population/employment per acre
Diversity: mixed use residential/commercial/jobs; variety of housing types
Design: aesthetics, sidewalks, street connectivity
Destination Accessibility: ease of trip from point of origin
Distance to Transit: 1/4 to 1/2 mile from home or work

Local Governments Rethink Development Patterns

Many of the region's communities already embrace development patterns that reduce transportation impacts and preserve rural landscapes.

"Encourage growth in existing population nodes and focus future development into serviceable areas of the County." (Pulaski County Comprehensive Plan: http://www.pulaskicounty.org/pc_comp_plan/pc%20plan%20introduction.htm)

"Redevelopment of underutilized residential and business properties should be pursued for development before considering new development on vacant, undeveloped land." (Radford City Comprehensive Plan: http://www.radford.va.us/images/2030_Radford_Comp_Plan.pdf)

The Town of Blacksburg has fully embraced this approach to new development in its 2012 Comprehensive Plan (http://www.blacksburg.gov/Index.aspx?page=269). Among its Community Character and Land Use objectives are:

- "Well-designed pedestrian and bicycle friendly routes and facilities are essential to the Town's identity as a walkable and bikeable community. Pedestrian circulation systems are required to be constructed in all new developments."
- "Explore programs to encourage more construction in Town of EarthCraft certified and U.S. Green Building Council's LEED certified buildings."
- "Encourage residential infill in the Downtown area. Support the addition of a mix of uses and services that will attract and support a Downtown residential population."

Buying the electricity needed to charge an electric vehicle is roughly equivalent to buying gasoline at $1 per gallon.

Another opportunity for efficient transportation in the NRV is the expected growth of plug-in electric vehicles. Compared to gasoline vehicles, electric vehicles have 1/4 the operating cost. For instance, at today's energy prices, buying the electricity needed to charge an electric vehicle is roughly equivalent to buying gasoline at $1 per gallon.[1] Furthermore, these vehicles emit about 1/4 less overall carbon emissions, even with the region's coal-based electricity, and provide a ready market for renewable electricity. More importantly, creating an electric-vehicle charging infrastructure demonstrates a community's commitment to a clean energy future. Some states and communities are investing heavily in charging infrastructure in anticipation of this market. Although there is much less activity in Virginia, the NRV does have a growing number of publicly available charging stations.

What communities can do to enhance livability and efficiency of town and village living:

STRATEGIES 03

one

Improve building efficiency in towns and villages to reduce energy expenditures.

- Target town- and village-based residential retrofit programs to older, less efficient homes and/or those dependent on **expensive fuel types.**
- Target town- and village-based residential retrofit programs to more vulnerable, low-income and elderly homeowners.
- Expand efficiency retrofit programs to multifamily and commercial buildings.

definition

More **expensive fuel types** tend to be electricity, fuel oil, and propane.

two

Enhance energy efficiency in new construction and development.

- Offer incentives for construction or development practices that achieve **enhanced energy efficiency standards**.
- Inventory and highlight successful energy efficiency development projects in the region.

definition

"Enhanced Energy Efficiency Standards" include EarthCraft, Energy Star, LEED, and Passivhaus.

three

Enhance walkability and bikeability through pedestrian-friendly, compact, and mixed-use land development.

- Adopt plans, incentives, and policies that encourage mixed-use, pedestrian-friendly and compact development near town centers.
- Undertake the creation of community-scale pedestrian and bicycle master plans utilizing **complete streets** principles.
- Expand safe and convenient walking/biking options between residential areas and key community destinations.

definition

"Complete Streets" are designed and operated to enable safe access for people of all ages and abilities. Complete Streets make it easy to cross the street, walk to shops, and bicycle to work.
**Smart Growth America*

four

Improve community transit opportunities in the NRV.

- Prioritize alternative transportation projects that link key destinations and multiple communities.
- Target transportation investments towards projects that integrate more than one mode of transportation.
- Enhance existing transit routes and expand service where possible.

five

Support the growing electric vehicle market.

- Develop a network of charging stations.
- Encourage municipal and commercial adoption of electric vehicles.
- Publicize the benefits of plug-in vehicles and the locations of charging stations.

1. Electric Drive Transportation Association: www.electricdrive.org/index.php?ht=d/sp/i/27132/pid/27132

PRINCIPLE

04

Reduce the Environmental Impact of Energy Use

The New River Valley is highly dependent on fossil fuel energy.

The region's current patterns of energy use are not only raising concerns about affordability and reliability, but also about the impacts that a fossil-fuel dominant energy system has on the natural landscapes and ecosystems that NRV residents value and wish to protect.

Fossil fuels, including coal-fired electricity and petroleum-based transportation fuels, have significant environmental impacts on lands and waters from their extraction, transportation, and processing. Furthermore, the combustion of these energy sources contributes to local air pollution and **greenhouse gas** emissions, which have negative impacts on human health and the climate.

It is estimated that the New River Valley's energy related carbon dioxide (CO_2) emissions are at least 30% more than the Virginia average, largely because of the region's higher dependence on coal-generated electricity.[1] This high level of carbon emissions increases the region's vulnerability because further federal and state actions to protect air and water quality will likely increase the price of fossil fuel energy. For example, since 2005, Appalachian Power Company (APCO) has invested $2 billion in sulfur emissions controls at its power plants, which has led to significant increases in the region's electricity rates.

definition

Greenhouse gases in the atmosphere absorb the Earth's back-radiation and trap heat in the atmosphere, and scientists believe they contribute to global warming and climate change. Common greenhouse gases in the earth's atmosphere include water vapor, methane, oxides of nitrogen, ozone, chlorofluorocarbon, and carbon dioxide. Fossil fuel energy use has dramatically increased emissions of carbon dioxide and methane.

Comparison of Energy Related CO_2 Emissions
(metric tons per person per year)

**Randolph, 2013*

	2010	2012
U.S.	18.2 mt/p-y	17.1 mt/p-y
VIRGINIA	13.8 mt/p-y	NA mt/p-y
NRV	18.5 mt/p-y	17.5 mt/p-y

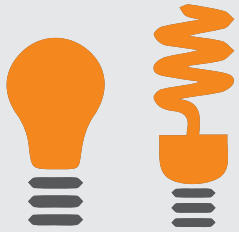
*No data is available for VA in 2012, but emissions likely dropped an amount comparable to that of the NRV from 2010 to 2012.

Renewable wind, solar, small hydroelectric, some biofuels, and all energy efficiency technologies are referred to as "clean energy" because of much lower impacts on land, water, air, and ecological systems per energy unit than fossil fuel based energy sources, but even these "clean" sources still carry with them some negative environmental impacts. Biofuels have agricultural impacts when produced and create some pollution when burned. Furthermore, there are legitimate concerns about how converting agricultural crops to fuel-stock crops might impact food prices on a global scale. Hydroelectric dams and reservoirs affect water flow and temperature, which has impacts on surrounding plants and animals. Wind systems have aesthetic impacts and affect bird and bat mortality, though not substantially when compared to other more common threats like habitat destruction, domestic cats, and windows.[2]

The energy production and efficiency components for all of these systems also have manufacturing impacts on the environment. For example, mining and processing of the raw materials and trace minerals used in the production of wind and solar equipment have some adverse environmental impacts, some of them significant.

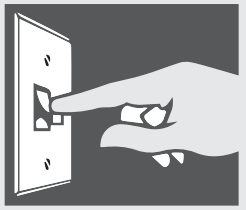
Since all energy sources have some adverse impact, reduction of how much energy is used through energy efficiency improvements and conservation behavior may have the greatest environmental benefit for the region. **Efficiency and conservation are not the same.** Energy efficiency improvements provide the same energy function with less energy. For example, an LED light bulb will produce the same light as an incandescent bulb but with 1/10th the energy, and sealing air leakage and installing insulation will result in less heating energy needed to keep a house at the same thermostat setting. On the other hand, energy conservation aims to reduce energy waste through smart consumer behavior. For example, turning off the lights when they are not needed or turning down the winter thermostat when not at home.

Energy Efficiency



Using less energy to produce the same amount of light.

Energy Conservation



Using less energy by turning OFF the lights when not needed.

What communities can do to reduce the environmental impact of energy use:

STRATEGIES 04

one

Improve energy efficiency in buildings, industry, and transportation to reduce the environmental impact of energy sources.

- Implement strategies under Principles 3 and 5.

two

Foster a culture of conservation and energy efficiency in households, businesses, institutions, and municipalities throughout the NRV.

- Develop and implement education and outreach programs for residents on reducing energy waste through conservation behavior (e.g. adult education or KEEP, an energy education program focused on K-12).
- Work with the NRV Realtors Association to include green features and certifications in the MLS system.
- Promote appraisal accuracy of green or energy efficient buildings through appraiser and realtor education and modernization of the appraisal process.
- Work with lenders to offer buyers **energy efficient** or **energy improvement mortgages** through a green addendum in the loan process.
- Continue to offer and enhance energy services training and certifications to existing local contractors or others interested in becoming energy professionals.
- Implement a community loan program for home energy monitors and other tools or devices that residents can use to track their energy use.
- Develop an energy information clearinghouse that provides a list of local energy businesses, available financing options, energy assessment tools, and resource database.

three

Replace high-impact energy sources with low-impact energy sources in order to help lower emissions.

- Encourage utility providers to transition to low-impact energy sources.
- Develop distributed renewable energy systems in the NRV.

definition

"Energy Efficient Mortgages" use the energy savings from a new energy efficient home to increase the home buying power of consumers and capitalize the energy savings in the appraisal. **"Energy Improvement Mortgages"** finance energy upgrades of existing homes in the mortgage loan using monthly energy savings.

definition

Fossil fuel combustion energy sources are considered to be **"high-impact"** because of extraction, processing, transport, and combustion impacts. They are the major source of air pollution and greenhouse gas emissions. Coal has a higher impact than oil, and oil has a higher impact than natural gas. Nuclear power is a lower impact, higher risk energy source – it does not require combustion, but it has mining, processing, and long-term waste management impacts. Renewable energy sources tend to be **"low-impact"** because there is no combustion and lower impact from manufacturing and materials acquisition. Efficiency is the lowest impact energy source because it reduces the need for energy no matter what its source.

1. Randolph, J. (2013). New River Valley Regional Energy Plan: Technical Report.
2. Sibley, D. (2010). Causes of Bird Mortality. Retrieved from www.sibleyguides.com/conservation/causes-of-bird-mortality/

PRINCIPLE

05

Improve Building Efficiency Starting with Residential Retrofit

The New River Valley's existing buildings present the most significant opportunity for improved energy efficiency.

Mt. Tabor Meadows
Green Valley Builders
Blacksburg, VA

Nationwide, buildings alone consume three-quarters of the electricity used and more than 40% of total energy. The NRV energy profile shows a similar breakdown, and residential consumption is the prime driver of rising energy costs. New building construction must comply with energy requirements under the Virginia Uniform Building Code, which is made more stringent every three years. Many NRV builders are also going beyond the code and developing highly efficient **EarthCraft, Energy Star, LEED,** and **Passivhaus** buildings that further reduce energy use and future energy costs for newly constructed homes and commercial buildings. For example, Green Valley Builders' Mount Tabor Meadows is a Blacksburg subdivision of all EarthCraft-certified homes and also includes the region's first home certified under the LEED Home protocol.

EarthCraft homes are designed and built with attention to how the different components of a home work together. These homes are 28% more efficient on average than standard homes.

LEED for Homes promotes the design and construction of homes that use less energy, water and natural resources and that create less waste. LEED homes are typically 15-20% more efficient than standard homes.

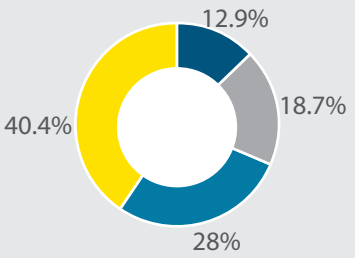
ENERGY STAR homes meet strict guidelines for energy efficiency set by the U.S. Environmental Protection Agency. These homes are typically 15-20% more efficient than standard homes and include additional energy-saving features that can make them as much as 20–30% more efficient.

Passivhaus is a super-efficient performance design protocol for new construction that is about 85% more efficient than current code. It originated in Germany and is applied in the U.S., including a new dormitory at Emory & Henry College.

*Randolph, J. and http://mtmblacksburg.com/standard-features/green-certifications/

*Efficiency calculations based on the national Home Energy Rating System (HERS) scale, where a typical existing home receives a HERS rating of 130, a new standard code home is 100, and a net-zero-energy home is 0. An average EarthCraft home receives a HERS rating of 72, average Energy Star and LEED homes receive scores of 80-85, and a Passivhaus home receives a score of 15.

PERCENTAGE OF TOTAL HOUSING STOCK BY YEAR BUILT

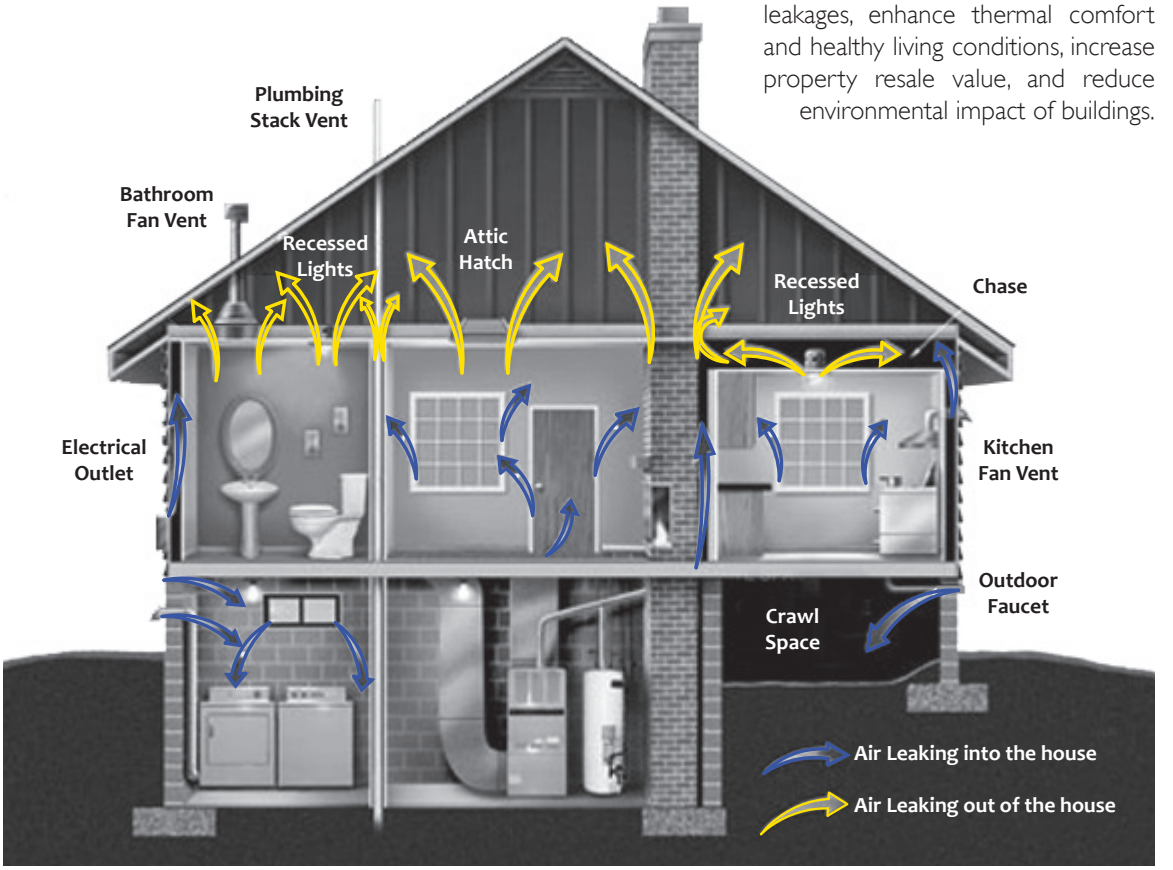


*U.S. Census Bureau, ACS 2005-2009

Much of the existing housing and commercial building stock, on the other hand, is old and inefficient. **More than half of NRV housing units were built before 1974 (before building codes had energy efficiency standards), and 1/4 were built before 1960.** Therefore, it can be assumed that a large percentage of existing buildings in the region are poorly insulated and very inefficient when compared to current standards. This means that there is significant opportunity to improve the energy efficiency of the region's older existing buildings, reduce energy use and costs, enhance thermal comfort and healthy living conditions, and increase property resale value while reducing environmental impact.

State, regional, and local residential energy efficiency programs have begun to take the lead in advancing community energy efficiency goals. These programs take a "whole house" approach to make existing homes healthier, safer, and more affordable, durable, and energy efficient. Many offer one-stop shopping for homeowners seeking home energy assessments, comprehensive retrofits, as well as information on potential financing, rebates, and incentives. **Energy efficiency improvements typically include air sealing and insulating the thermal envelope, duct sealing, HVAC upgrades, lighting improvements, and more.**[1]

Energy efficiency improvements, such as those that help to prevent air leakages, enhance thermal comfort and healthy living conditions, increase property resale value, and reduce environmental impact of buildings.

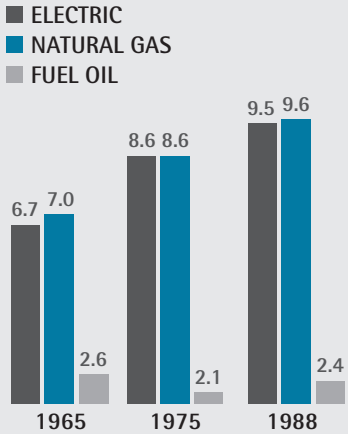


*Vermont Energy Audit (www.vermontenergyaudit.com/services.html)

Around the country, the backbone of the energy efficiency industry has been the federal **Weatherization Assistance Program (WAP).** The WAP program installs efficiency measures in low-income households at no cost to the home owner and operates in all states. In the NRV, the WAP program is administered by Community Housing Partners (CHP). CHP also runs the nationally recognized Energy Solutions Research and Training Center, which advances and trains contractors in the latest energy retrofit techniques. Formerly New River Center for Energy Research and Training (NRCERT), the Center was awarded the national 2013 Residential Energy Efficiency award for Weatherization by the State and Local Energy Report, a quarterly magazine representing state-level energy officials. CHP has been and continues to be a valuable resource for residents of all income levels to find the technical and financial resources they need to improve the energy efficiency of their homes.

The high upfront costs of whole-house residential energy efficiency retrofits create a major barrier to energy efficiency investments, even though it has been demonstrated that these investments will pay for themselves over time. **The cost effectiveness of a particular energy retrofit project depends on many factors: the age and efficiency of the structure, the type of fuel used, and financing terms.** Although the costs of retrofits are higher for older homes, typically the return on investment is much greater, especially for homes that heat with more expensive fuel types like fuel oil and propane. The energy savings provided by these retrofits can be used to pay back the initial costs, typically in less than 10 years. Older home retrofits pay back more quickly despite higher investment, and typically, retrofits done on fuel oil-heated homes pay for themselves in less than 3 years.[2]

AVERAGE PAYBACK PERIOD FOR A HOME ENERGY RETROFIT
(NUMBER OF YEARS)



Proffitt, 2013.

There are numerous cost-effective mechanisms that individuals can use to finance retrofit projects. Bank financing options include conventional loans and home equity loans. There are also special retrofit loan programs, which tend to be the most cost effective for houses of all ages and fuel types but are more limited in the amount a homeowner can borrow. Other effective mechanisms for financing energy efficiency improvements include utility **demand-side management (DSM)**, **on-bill financing,** and **property assessed clean energy (PACE) programs.**

Unfortunately, many of the most effective energy retrofit financing programs are currently not available to NRV residents. Therefore, the best prospects for advancing building retrofit in the NRV may come from possible future developments, including:

- Community Housing Partners (CHP) joins forces with Charlottesville's **LEAP** in a statewide residential retrofit program.
- APCO develops its 2014 filing for a DSM energy efficiency program that partners with CHP, **LEAP/HPwES alliance**, and WAP for program delivery.
- Blacksburg or another NRV jurisdiction develops its own PACE program for commercial and/or multifamily building retrofits.
- Radford Electric Department (RED) and/or Virginia Tech Electric Service (VTES), both municipal utilities, develop an energy efficiency program for targeted customers, possibly partnering with CHP, LEAP/HPwES alliance, and WAP, to implement on-bill financing.

These projects have the potential to help create a culture of building energy efficiency and conservation by making energy retrofit easy, attractive, profitable, and the social norm through removal of barriers, attractive financing, and social marketing.

definition

"DSM" refers to actions facilitated by utility companies on the customer's side of the meter to change the amount or timing of energy consumption. The utility's DSM program costs are absorbed into the utility rates and, in Virginia, at least three of the following parties must benefit: the participating customer, the utility, all ratepayers, and/or society.

"On-Bill Financing" requires little upfront investment by the owner and the payments are made through the utility bill. In most programs the new lower monthly energy bill plus the loan payment are the same or less than the pre-retrofit energy bill. When the house is sold, the new owner continues to pay off the retrofit financing. No Virginia utilities offer on-bill financing of efficiency measures.

With **"PACE"** programs, payments for retrofit (or renewable energy) investments are included in the property assessment and paid through the property taxes. Typically, local governments offer property owners a loan, which is paid back through property tax bills over 15 to 20 years. The loan repayment obligation transfers with the property. PACE programs are authorized in Virginia, but residential PACE programs have been hampered because of Federal Housing Finance Agency objections.

definition

The "Local Energy Alliance Program **(LEAP)** of Charlottesville" is a nonprofit energy services organization that helps to make residential and commercial buildings more energy efficient.

The New River Valley's Community Housing Partners (CHP) is partnering with **LEAP** to replace its CAFE^2 program with the Home Performance with Energy Star **(HPwES)** service.

What communities can do to improve building efficiency:

STRATEGIES

05

one

Expand existing programs for residential energy retrofit.

- Expand weatherization assistance programs for low-income homeowners by advocating for increased federal and state funding.
- Develop attractive financing mechanisms for moderate-income homeowners to pursue energy retrofits.
- Expand retrofit programs to apartments, rental housing, and the commercial sector.

two

Explore new partnerships and financing arrangements for residential and commercial building energy retrofits.

- Encourage utility providers to develop and implement a utility demand-side management program.
- Explore and advocate for a PACE-type financing program for commercial and residential buildings, both for owner- and renter-occupied units.
- Take advantage of innovative financing mechanisms as they become available.

three

Promote advanced energy efficiency in new building design and construction.

- Ensure enforcement of upgraded uniform state building codes.
- Offer incentives for construction or development practices that achieve **enhanced energy efficiency standards.**

definition

"Enhanced Energy Efficiency Standards" include EarthCraft, Energy Star, LEED, and Passivhaus certifications.

1. Proffitt, J. (2013). Sustainable Financing Mechanisms for Residential Energy Retrofit Programs in Virginia. Major paper, Master of Urban & Regional Planning. Virginia Tech.
2. Proffitt, J. (2013). Sustainable Financing Mechanisms for Residential Energy Retrofit Programs in Virginia. Major paper, Master of Urban & Regional Planning. Virginia Tech.

PRINCIPLE 06

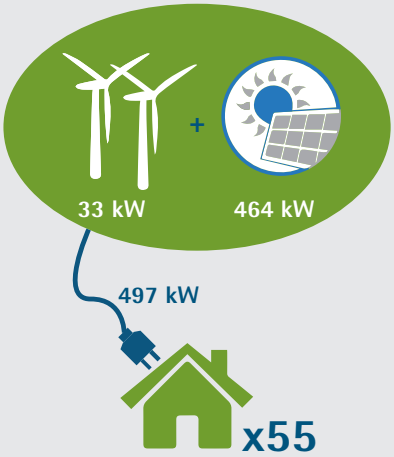
Develop Renewable Energy Systems

The New River Valley has significant renewable energy potential and capacity.

In addition to building efficiency, development of renewable energy, especially solar photovoltaic (PV) systems, provides the New River Valley its best opportunity to advance clean energy. The region already has two hydroelectric dams (Appalachian Power's Claytor Lake Dam and Radford Electric's Little River Dam), and it has abundant wood fuel and other biofuel potential. **The NRV also has 464 kW of small solar capacity and 33 kW of small wind capacity for a total of about 500 kW (0.5 MW), which is equivalent to the total electricity use of 55 households.**[1]

The potential for renewable energy in the region includes several sources:

- Wind potential depends on average wind speed, which is generally low in the area, but there are some ridge tops in the region that have potential; however, the impact of wind turbines on viewsheds and the region's rural character is a concern for many citizens.
- Methane driven turbines fueled by landfill gas recovery and sewage sludge digestion has some potential. There is a landfill gas recovery project at the Montgomery County landfill. Given the region's small waste-generating population base, however, this and possible combustion of municipal waste provide a small energy potential.
- Solar energy provides the most potential for renewable energy development in the NRV. The region has a good solar resource, a foundation of existing solar PV and thermal systems, experienced installation contractors, an excellent installer certification training program at New River Community College, utilities that facilitate grid interconnection and net-metering, and perhaps the lowest solar PV system installation costs in the mid-Atlantic.[2] **Existing rooftops and parking lots have the potential to supply a substantial amount of the region's electricity – installing solar PV on 10% of the region's south-facing and flat rooftops could provide 35% of the region's total electricity demand.**[3]



10%
south-facing and flat rooftops

COMPARISON OF SOLAR CAPACITY:
Virginia, NRV, Montgomery, and Floyd - Jan 2013

	Solar PV Capacity	Population	Solar Watts/Person
VIRGINIA	8,224 kW	8,186,867	1.00
NEW RIVER VALLEY	464 kW	178,539	2.40
MONTGOMERY COUNTY	261 kW	94,342	2.77
FLOYD COUNTY	130 kW	15,378	8.45 ★

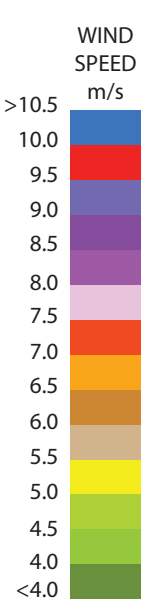
** Randolph, 2013*

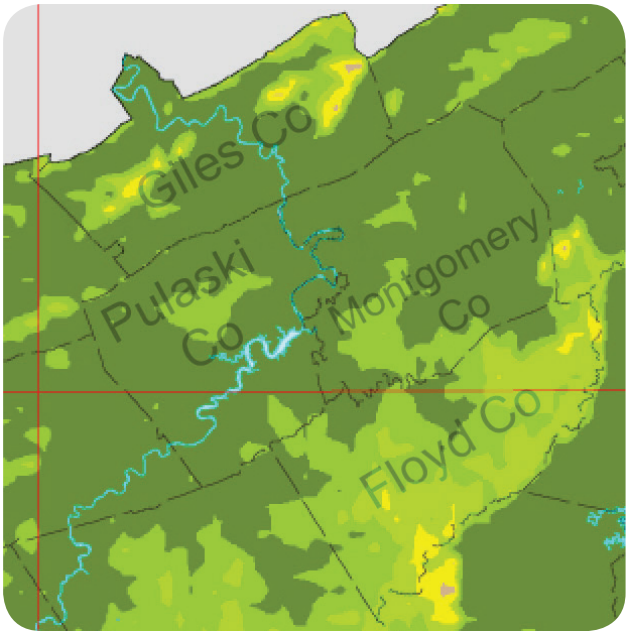
Wind Potential

The region's wind energy resource is marginal. Of the 33 kW of installed wind capacity in the NRV, 2/3 is in Pulaski and 1/3 is in Giles. Good wind sites in Floyd and Giles counties are constrained by proximity to the Blue Ridge Parkway and Appalachian Trail. In 2009-10, a potential wind project was proposed for Pulaski County's BSA Powhatan Camp, which prompted wind ordinances in both Pulaski and Montgomery. Small areas of potential commercial-scale ridge top sites exist in Montgomery County on Poor and Paris Mountains and perhaps at the top of Blacksburg's municipal golf course.

Residential scale 30-meter tower

Best sites with 5-5.5 meters/ sec (m/s) average wind speed are rated "poor".

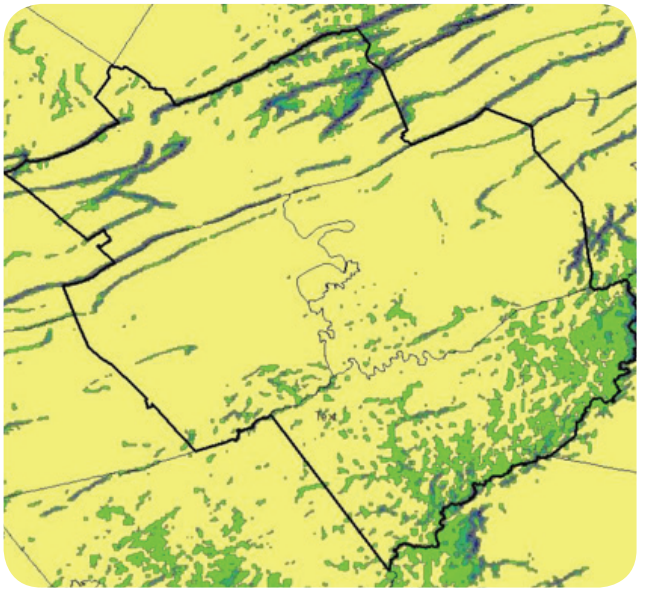




Commercial scale 50-meter tower

Best sites are on a few ridge tops with 6.4-8.0 m/s rated "fair" to "excellent". Most promising sites are SE Montgomery, NE Floyd, and NE Giles.

	Wind Power W/m ^{2}	Wind Speed m/s	Wind Speed mph
POOR	0-200	0 - 5.6	0 - 12.5
MARGINAL	200-300	5.6 - 6.4	12. 5 - 14.3
FAIR	300-400	6.4 - 7.0	14.3 - 15.7
GOOD	400-500	7.0 - 7.5	15.7 - 16.8
EXCELLENT	500-600	7.5 - 8.0	16.8 - 17.9



Landfill Gas Recovery

In partnership with Green kW Energy, the Montgomery Regional Solid Waste Authority (MRSWA) has completed a project to capture and convert into renewable energy the gas generated by the 1.3 million tons of waste in the now closed landfill. Green kW Energy designed, built, and now operates the landfill gas energy facility, which includes one 265-kilowatt generator and one 75-kilowatt generator.

The 53-acre landfill will generate an estimated 160,000 kilowatt-hours of green electricity per month, some of which will power MRSWA's administrative offices and a recycling center. The annual energy savings are estimated to equate to powering 200 homes.

As trash at the landfill decomposes, it creates methane gas, which rises to the top and is collected in pipes. The methane is then burned to produce heat or generate electricity.

Realizing the region's potential for solar requires favorable financial feasibility of installing these systems. Currently, solar PV systems are cost effective in the NRV with a payback period of 17-18 years for a 25-year life system. But compared to communities in Maryland, North Carolina and many other states, the NRV is at a disadvantage because of Virginia's weak renewable energy policies that affect system economics. Many private solar PV owners will report installing their systems for environmental and personal reasons, but for significant growth of solar capacity in the region to occur, there will need to be a more favorable economic return on the investment from installing a PV system.

Financial assessment of any renewable energy investment depends on comparing upfront costs of and long-term revenues from the system. Upfront costs are the main barrier to installing a renewable energy system, but these systems can be made more affordable by reducing market prices of installed systems; providing government incentives like tax credits, rebates and grants; creating programs that allow individuals to work together and take advantage of savings that come from buying in bulk; allowing **third-party financing** through **solar leases** or **power purchase agreements**; and by allowing owners to pool resources and create community-scale renewable energy systems in which costs and benefits are shared.

definition

"Third-Party Financing" is most commonly used with solar PV systems and primarily occurs through two models: **power purchase agreements (PPAs)** and **solar leases**. In the PPA model, an installer/developer builds a solar energy system on a customer's property at no cost. The solar energy system offsets the customer's electric utility bill, and the developer sells the power generated to the customer at a fixed rate, typically lower than the local utility. At the end of the contract term, property owners can extend the contract and even buy the solar energy system from the developer.

In the lease model, a customer signs a contract with an installer/developer and pays for the solar energy system over a period of years or decades, rather than paying for the power produced. Solar leases can be structured so customers pay no up-front costs, some of the system cost, or purchase the system before the end of the lease term. This is similar to leasing structures used for cars and office equipment.

**Solar Energy Industries Association www.seia.org/policy/finance-tax/third-party-financing*

definition

"Net-Metering" is a billing mechanism that credits renewable system owners for electricity that is produced in excess of what they consume. In short, the customer's meter runs backward as excess energy is generated and runs forward as electricity is drawn from the grid. System owners get credited for the "net" amount if they produce more than they consume in a given month.

"Feed-In Tariffs" offer renewable energy project developers guaranteed payment for electricity produced by renewable energy systems over a fixed period.

"Renewable Energy Credits" (RECs) are property rights to environmental, social and other non-power qualities of renewable electricity generation that can be sold for money. As renewable generators produce electricity, they have a positive impact, reducing the need for fossil fuel-based generation sources to meet consumer demand. RECs embody these positive environmental impacts and convey these benefits in monetary form to the owner. A viable market in RECs goes hand in hand with a mandatory Renewable Portfolio Standard (RPS) – a state requirement for a certain percentage of energy production to come from renewable sources. Virginia currently only has a voluntary RPS.

"Production Tax Credits" are per-kilowatt-hour tax credits for electricity generated by qualified energy resources and sold by the taxpayer to an unrelated person during the taxable year.

Revenues from renewable energy projects offer a way to recover the up-front costs. Some mechanisms for balancing the upfront costs of renewable energy systems include **net-metering, feed-in tariffs, renewable energy credits, production tax credits,** and third-party financing.

Because the upfront cost, revenues, and financial feasibility of renewable energy systems are affected by government policies, Virginia utility and energy policy will likely determine the pace and amount of future solar development in the NRV. These policies are evolving, and each year the General Assembly considers a range of related bills. The political process involved in preparing, lobbying, and debating policy options is dynamic. Utilities yield significant political power in Virginia, and other stakeholders and interests also affect the process to varying degrees.

Solarize Community Programs aim to provide communities with the information and resources needed to reduce the up-front costs of solar installation through bulk purchasing of system components and other "economy of scale" techniques. First used in Portland, Oregon, the Solarize Community concept spread to statewide programs in Massachusetts, New York, Connecticut, and Oregon, and many cities, including Brooklyn, Santa Barbara, and Madison. The Solarize Mass program conducted a pilot in four Massachusetts communities in 2011, and the combination of community outreach and education and reduced prices from bulk purchase stimulated a significant growth in installations.

Community-Scale Solar Development Projects involve multiple individual owners living in geographic proximity to the project and sharing the costs and benefits of ownership of the solar system. Local residents create a community solar entity that hires a third party to install the panels. Electricity is sold to the local utility, and the proceeds are allocated by providing credits on the residents' electricity bills. Such projects can provide economies of project scale, which lowers per kW costs and increases the opportunity for people to invest in community solar who traditionally cannot (e.g., renters, residents with shaded property). In Virginia, traditional net-metering rules inhibit Community Solar, but enacting the Community Renewables Net Metering law introduced in the 2013 General Assembly would eliminate this barrier. A good example is the Colorado Energy Collective, which developed the first Community Solar project, a 77 kW ground-mounted system owned by 20 residents in El Jebel, CO. The project employed a PPA and was able to tap federal tax credits and other incentives.

What communities can do to develop renewable energy systems:

STRATEGIES 06

one
Work with the region's municipal utilities (Virginia Tech Electric and Radford Electric) to develop power purchase agreement projects on public buildings.

two
Reflect solar and renewable energy development goals in NRV local government plans and ordinances.

- Include energy efficiency and renewable energy development in updates of local comprehensive plans.
- Adopt model solar and wind ordinances developed by DEQ to demonstrate commitment to removing barriers and facilitating renewable energy development.
- Adopt state-authorized property tax exemptions on the value of renewable energy installations to demonstrate commitment to facilitating renewable energy development.

three
Explore a pilot community "Solarize" type program to generate interest for bulk pricing of solar energy installations at the neighborhood/community scale.

four
Identify new opportunities for other renewable energy projects, such as methane capture, geothermal, and wind.

five
NRV localities and local groups should continue to lobby for more effective state renewable energy policies and work with local utilities to advance the region's interest in renewable energy development.

six
Take advantage of state policies and innovative financing mechanisms as they become available.

definition

"Methane Capture" is the process of using the methane gas that is created as trash decomposes (or rots) in landfills to produce heat or generate electricity.

"Geothermal" energy systems use heat from the Earth to improve the efficiency of traditional heat pump technologies.

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1. Calculated by John Randolph. (Assumptions used for calculation: A 1 kW solar or wind system will supply about 1300 kWh/year in the NRV, so 500 kW capacity will provide 660,000 kWh/yr or 55,000 kWh/month. Residential customers use on average about 1000 kWh/mo.)
2. Randolph, J. (2013). New River Valley Regional Energy Plan: Technical Report.
3. Peterman, R., Hill, W., Carpenter, D. (2011). NRV Energy Resources Group Report, Solar and Wind Renewable Energy Potential. UAP 4364 Senior Seminar. Virginia Tech.

PRINCIPLE 07

Adopt Local Policies and Promote State Policies to Implement the NRV Regional Energy Plan

The New River Valley has been placed at a disadvantage because Virginia's energy policies lag behind the rest of the nation and neighboring states.

Virginia ranks 33rd in solar energy policy[1] and 37th in energy efficiency policy[2], far behind neighboring jurisdictions Maryland (2nd in solar, 9th in efficiency), the District of Columbia (6th in solar, 27th in efficiency), and North Carolina (14th in solar, 22nd in efficiency). These poor rankings put Virginia and the NRV at a competitive disadvantage in developing clean energy and attracting businesses interested in locating where clean energy is available.

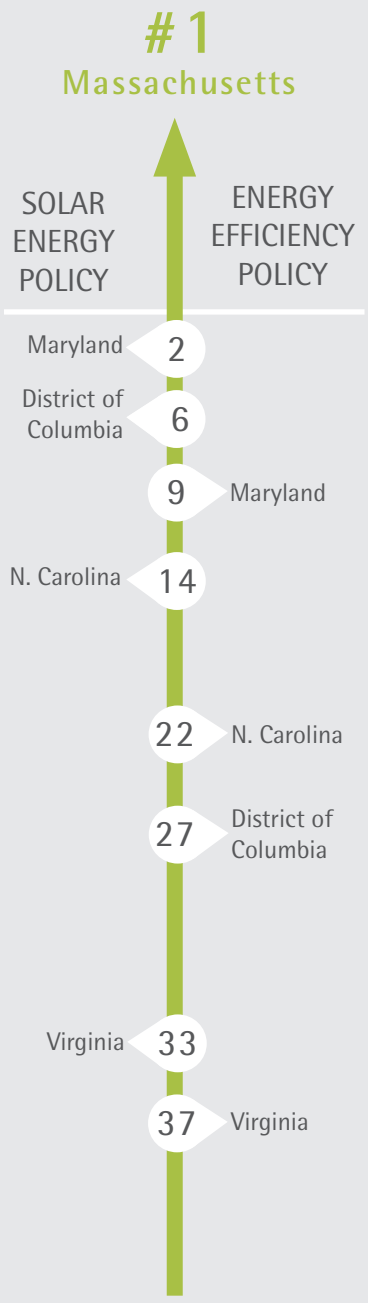
There are, however, opportunities for working within the confines of restrictive state policies related to energy. In some cases nationwide, local chambers of commerce have facilitated clean energy initiatives to assist its member businesses and attract new industry and investment.

AUSTIN, TEXAS

Within one of the largest oil and natural gas producing states in the nation, the Greater Austin Chamber of Commerce leveraged its close ties to The University of Texas and the city's municipally owned utility to recruit 20 clean-tech companies to Austin. The Austin Chamber played a key role in developing a cutting-edge demonstration community for smart grid technologies, helps strengthen clean energy startups through a local incubator, and actively works to position Austin as a top location for entrepreneurs, investors, and clean-tech businesses.

MERRIMACK VALLEY, MASSACHUSETTS

Forty-six companies in Northeast Massachusetts expect to save more than $30 million collectively over the next 30 years, thanks to the Merrimack Valley Chamber of Commerce's award-winning clean energy program. In June of 2010, as businesses all over the United States struggled to stay competitive despite rising energy costs, the Chamber developed a pioneering plan to help its members cut their utility bills and attract new investment to the region. Working with a local clean energy solutions provider and government officials, it took just two years to set forty-six companies on the path to long-term energy efficiency and on-site clean energy generation.



Local governments also have the opportunity to stimulate clean energy initiatives when they lead by example through changes to their own actions and policies. In the NRV, some local governments are beginning to give attention to energy in their planning and policies. Most local governments in the region address energy and the benefits of local energy efficiency, renewable energy, and compact development options in their comprehensive plans. The Town of Blacksburg's experience in energy, climate protection, comprehensive planning, and environmental programs has given the Town national recognition and provides a model for the region's local governments.

There is, however, still work to be done. Many of the region's localities have not yet taken full advantage of opportunities for cost-effective energy efficiency improvements in municipal and school buildings, and few NRV localities address energy use in their implementing ordinances or capital improvement plans. Pulaski is the only NRV locality to adopt a property tax exemption for the value of an installed solar system, authority for which was established in 1977. In the summer of 2013, a new stakeholder group was convened by the Department of Environmental Quality (DEQ) to discuss renewable energy policy options. In addition to the utilities representatives and renewable energy interests, the group includes four NRV residents. The process aims to advance state policy for renewable energy development.

Radford Comprehensive Plan

Goal 1-2. Promote regional coordination and long-range planning for public utility facilities and services.

Strategy D. Coordinate and promote the regional utility services that are in the best interest of the City; engage Pulaski County and Montgomery County in regional utility matters as needed.

Strategy E. The City should be on the cutting edge of technology for energy independence and sustainability by utilizing solar, wind and other renewable energy sources.

Floyd County Comprehensive Plan

As national leaders debate energy policy, private citizens and businesses are struggling to afford energy to heat and cool their homes and to get to and from work and school. There is practical interest now from many in finding alternative fuel supplies, such as solar, wind, geothermal and biofuels for homes and businesses. There are also increased opportunities for energy savings through energy efficient programs and investments.

The County seeks to enable and encourage all safe and reasonable small-scale power generation in the community. Furthermore, the County will continue to encourage federal- and state-funded programs for weatherization and energy-efficiency to serve more eligible households and facilities in Floyd County.

Christiansburg Comprehensive Plan

Ensure access to natural gas throughout Town.
Foster the development of alternative energy sources and provision.
Ensure the Town Code allows for the safe use of alternative energy sources.

Blacksburg Comprehensive Plan

Advancement of the community as an energy efficient model will not only lessen energy consumption locally, but will also encourage surrounding communities to conserve, which will lead to a reduction of migratory air pollutants.

Transportation accounts for most of the total end use energy consumed by the Town of Blacksburg. The Town can improve its transportation energy efficiency and reduce pollutant emissions with its transit system, a reasonably compact development pattern, and by expanding the greenway, bikeway, and walkway systems. Some of the land use patterns and techniques can include planting trees and other landscaping materials, orienting buildings to maximize solar energy efficiency, and reducing trip generation by redeveloping infill sites with a mix of uses or clustering development.

For power, the Town currently relies on traditional energy sources from a limited number of energy suppliers. To achieve the Town's sustainability goals, alternative energy sources and suppliers are needed and desired.

What communities can do to adopt local policies and promote state policies to implement the NRV Regional Energy Plan:

STRATEGIES 07

one

Use local and regional energy advisory committees to develop and promote energy policy initiatives.

- Working groups established under Principle 8 should focus on meaningful local policy initiatives to advance clean energy.

two

Adopt local policies to advance clean energy.

- Incorporate energy into comprehensive plans and land use, housing, and transportation elements.
- Adopt local renewable energy model ordinances developed by the DEQ.
- Adopt renewable energy property tax exemptions authorized by state code.
- Incentivize beyond-the-code building energy efficiency through expedited permitting and/or information programs.
- Consider PACE and municipal utility on-bill financing for efficiency retrofits and renewables.

three

Promote state policies that advance community clean energy development.

- Enhance state utility policies for utility demand-side efficiency programs.
- Extend the current pilot program authorizing limited renewable Power Purchase Agreements (PPAs) in Dominion Virginia Power's service area to statewide.
- Revise PPA capacity limits to include residential-scale systems.
- Extend the current agricultural net-metering policy to community-scale renewable energy projects.

four

Develop local government legislative package in conjunction with Virginia Municipal League and Virginia Association of Counties that promotes community clean energy policies, including policies above as well as:

- Adopt a mandatory **Renewable Portfolio Standard.**
- Create a mandatory **Public Benefit Fund** to support state incentives for efficiency and renewables (replace the current voluntary Solar Resource Development Fund).

definition

A **"Renewable Portfolio Standard"** is a mandate requiring that renewable energy sources provide a certain percentage of total energy generation in the state.

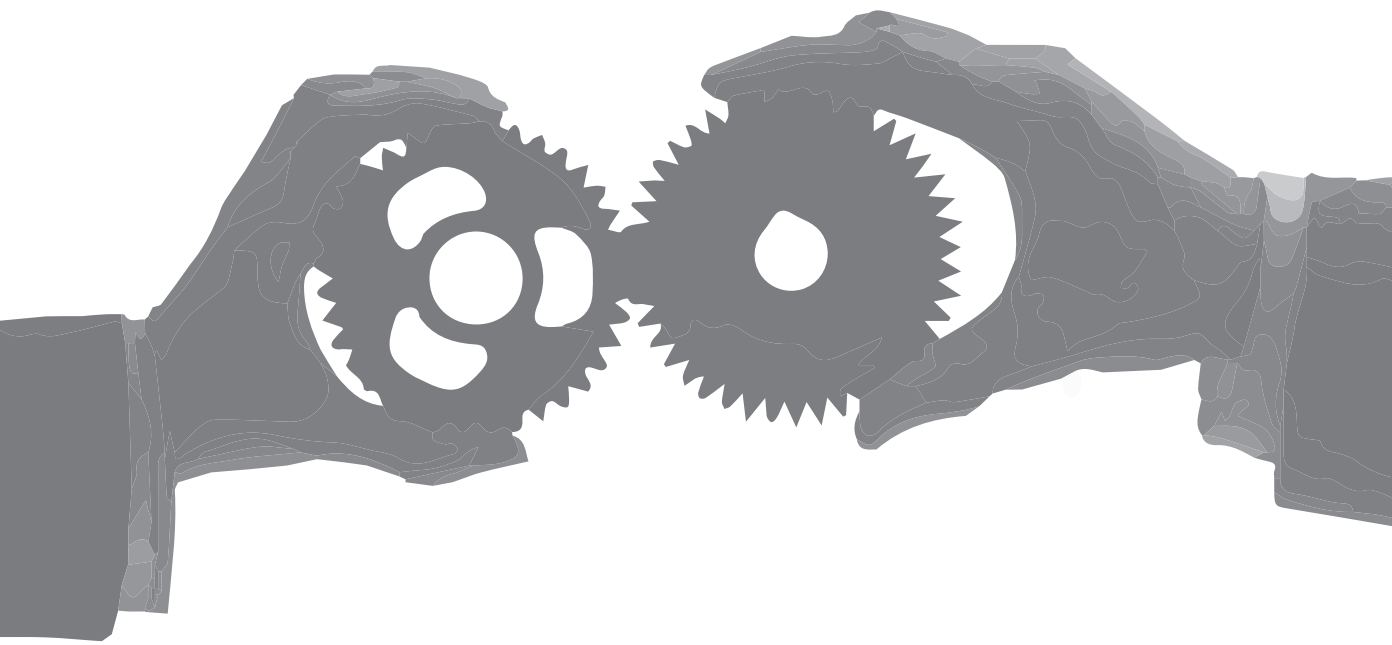
A **"Public Benefit Fund"** is dedicated to supporting renewable energy efficiency projects and is typically financed through a small charge on customers' utility bills or through specified contributions from utilities.

1. Solar Power Rocks. (2013). State Solar Policy Ranking. www.solarpowerrocks.com/2013-state-solar-power-rankings/
2. American Council for an Energy Efficient Economy (ACEEE). (2012). 2012 State Ranking in Energy Efficiency Policies. aceee.org/sector/state-policy/scorecard

PRINCIPLE 08

Engage Multiple Parties in Creating a Culture of Clean Energy

The New River Valley has a solid foundation of local players committed to advancing clean energy in the region.

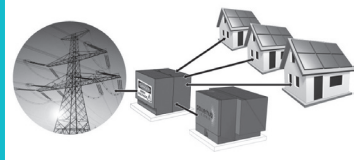


The New River Valley is home to excellent energy research and training programs. The region's colleges, universities and training centers provide an excellent foundation for energy technology development and workforce training. **Virginia Tech** is among the top 41 research universities in the nation and has special expertise in power electronics and electric power systems, building science and design, agricultural energy systems, energy management, and energy planning. **Radford University** is also producing an educated workforce in many fields related to developing clean energy systems, with programs in the sciences, business, and environmental studies, among others. **New River Community College** has extensive certification programs for renewable energy installers; and the **Energy Solutions Research and Training Center,** operated by Community Housing Partners, is a nationally award-winning weatherization training center for residential energy retrofit.

The **Virginia Tech** LumenHaus is a prototype design for a zero-energy dwelling. Designed and built by Virginia Tech faculty and students, the project has won numerous awards including the international Solar Decathlon competition in Madrid, Spain. The dwelling design and energy features are being considered for multifamily modular housing production.

The region is also home to many local firms with expertise in energy technology, new and retrofit building efficiency, solar photovoltaic (PV) and thermal installation, and industrial energy systems. These firms include architects and designers, building contractors, HVAC contractors, building energy retrofit contractors, solar system installers, and other entrepreneurial companies dealing with energy.

PowerHub Systems is an example of a successful start-up company spawned by university research. The Blacksburg firm specializes in distributed energy storage, intelligent power systems, and smart-grid compliance. The firm was awarded the Roanoke-Blacksburg Technology Council's 2012 Innovation Award and has deployed 6 demonstration energy storage units in California (3 in San Diego and 3 in Sacramento) and other installations for standby and emergency power.



Many large employers in the NRV are also dedicated to clean energy, providing models for other firms and institutions and helping to promote a culture of conservation throughout the region.

The **Volvo Trucks** plant in Dublin, Pulaski County's largest employer, is the largest Volvo truck plant in the world and is nationally recognized for its innovative clean energy initiatives. In 2012, it was the first U.S. facility to be certified to the top international and U.S. energy standards. Volvo Trucks' parent company, Volvo, has a goal to make all of its manufacturing facilities carbon-neutral by improving energy efficiency and using renewable energy. Volvo Trucks joined the U.S. Department of Energy's Industrial Technologies Program's Save Energy Now initiative in 2009, committing the plant to reduce energy intensity (i.e. energy per unit product) by 2.5% per year for 10 years. In 2011, the plant succeeded in reducing energy consumption by 25% in one year. The plant installed some solar PV panels and a 10-kW wind generator, but its greatest success came in engaging employees to come up with ideas to save energy. The Dublin plant aims to become the first carbon-neutral vehicle plant in the U.S. (U.S. DOE, 2011).

Volvo Trucks Plant in Pulaski Co. aims to be the 1st carbon neutral vehicle plant in the U.S.

Celanese Plant in Giles Co. is investing $150 million to switch from coal to natural gas.

Celanese Corporation also has strong energy efficiency and sustainability goals to reduce energy intensity and greenhouse gas emissions 20% by 2015. As part of this commitment and to reduce long-term costs, its Narrows plant, Giles County's largest employer, is investing $150 million in a project to replace its coal-fired boilers with natural gas-fired boilers, thus reducing the plant's carbon footprint. The project involves expanding a Columbia Natural Gas pipeline spur to serve the plant.

At the citizen level, several community organizations have already been created throughout the region to promote environmental sustainability and clean energy solutions. The most active are SustainFloyd and Sustainable Blacksburg. **SustainFloyd** aims to address global issues at the local level and is involved in a wide range of activities related to energy, food, arts and education. It sponsored the Floyd County Energy and Emissions Study that gave a baseline of energy use and carbon emissions for the county. **Sustainable Blacksburg** promotes local environmental stewardship and aims to enhance the region's livability by reducing its impact on the local and global environment. Sustainable Blacksburg partners with Virginia Tech and the Town of Blacksburg in the fall Sustainability Week of educational programs.

The expertise, experience, and citizen participation that the region already has provide a strong foundation for building a clean energy economy in the NRV. Still, achieving the region's potential requires overcoming several barriers, including limited investment capital and financing mechanisms, inconsistent local programs and political commitment, and insufficient state policy to advance clean energy. It is important that **all of the key players** discussed above collaborate and coordinate their efforts to overcome these challenges so that, together, they may create a regional culture of clean energy.

The **NRV's local governments and committee organizations** can develop energy efficiency and renewable energy projects and outreach programs.

The **NRV's energy service and design firms** can collaborate with local governments and community organizations to deliver effective clean energy services.

The **NRV's municipal and investor-owned utilities** can design and implement procedures and programs to enable and promote public and private investments in efficiency and renewable energy.

The **NRV's businesses and institutions** can demonstrate efficiency and renewable energy.

What communities can do to engage multiple parties in creating a culture of clean energy:

STRATEGIES

08

one

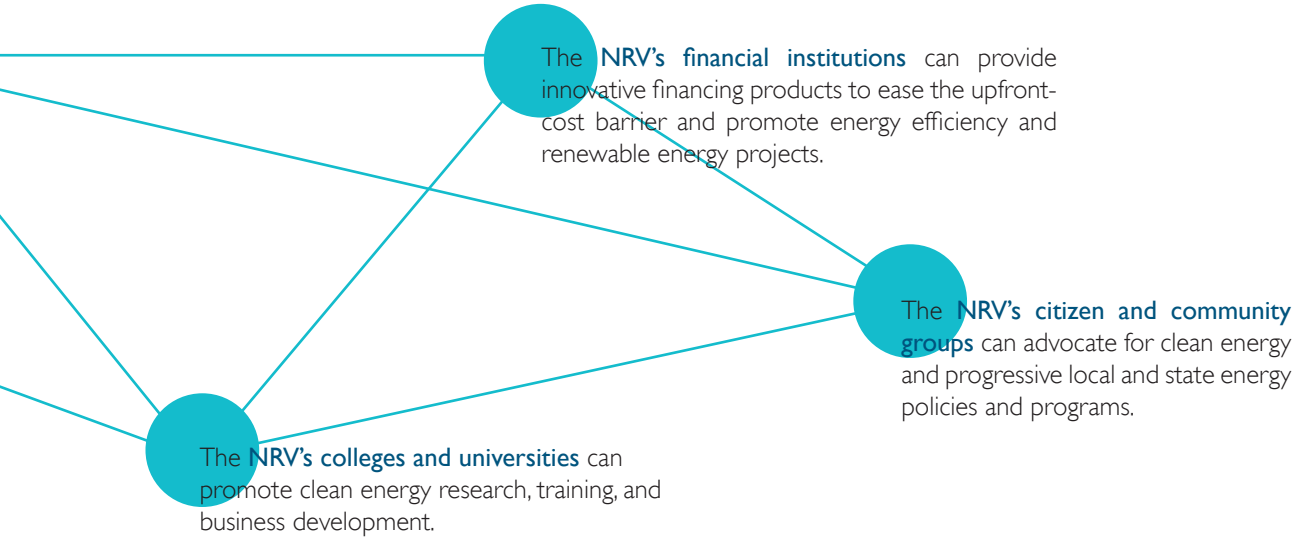
Establish local and regional energy advisory committees and groups.

- Coordinate establishment of targeted groups through the New River Valley Planning District Commission, local governments, businesses, and community organizations.
- Form short-term working groups to target specific energy sectors/sources/issues at the appropriate regional/local/neighborhood scale.
- As appropriate, include community stakeholders on these working groups: utilities, local government officials, colleges and universities, large employers, small businesses, financial institutions, property managers, energy service companies, non-profit and faith-based organizations, and citizen groups.

two

Enhance existing partnerships among local governments, educational institutions and the private sector to implement elements of the Regional Energy Plan.

- Collaborate with regional energy alliances.



CONCLUSION

Energy in the New River Valley explores a wide range of data, lessons, principles, and objectives to help move the NRV toward a clean energy future and to enable the region to play a larger role in the coming low-carbon economy. This transition can help reduce households' future energy costs, retain energy dollars to stimulate the local economy, better attract new businesses to the region, develop the NRV as a center of clean energy training and services, and reduce the region's energy impact on the environment.

This report intends to take a long-term view of the region's future prospects and opportunities, and a large number of objectives and strategies are presented. Some call for short-term implementation, others will likely take more time to be realized. Priority strategies must be judged on their technical, legal, political, economic and financial feasibility.

Energy in the New River Valley aims to:

- Reduce future increases in energy expenditures;
- Expand clean energy markets, businesses, and training to enhance the region's competitiveness in the future clean energy economy;
- Improve future energy reliability; and
- Reduce environmental impact of energy use.

The key objectives to achieve these goals are to:

- Improve energy efficiency of new and existing buildings;
- Develop distributed renewable energy systems;
- Curtail growth of transportation fuel costs through improved ride share and transit programs, electric vehicle infrastructure, and efficient land use;
- Establish partnerships to expand clean energy education, financing, and market development; and
- Adopt state and local policies to enable and promote clean energy markets.

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