

# Energy & the Built Environment

Carbon, Our Energy Future & You: A Community Workshop

## Background

Buildings come in a wide variety of shapes, sizes, and purposes, and they have been built at different times according to different standards. Addressing energy use in any given building requires a holistic approach to ensure the best results.\*

**Building design** can help determine the amount of lighting, heating, and cooling a building will require. Architects and engineers have developed innovative new ways to improve overall building design in order to maximize light and heat efficiency.

**Building envelope** is the interface or “shell” between the interior of a building and the outdoor environment. Minimizing heat transfer through the building envelope is crucial for reducing the need for space heating or cooling. Insulation, air sealing, and other improvements play an important role in minimizing heat transfer.

**Embodied energy** refers to the energy required to extract, manufacture, transport, install, and dispose of building materials. Efforts to reduce this energy use and associated emissions can be made as part of a larger effort to reduce emissions from buildings.

**Energy use in buildings can be improved** by utilizing efficient technologies to reduce GHG emissions by moderating energy use. In both residential and commercial buildings, energy consumption is dominated by space heating, cooling, air conditioning (HVAC) and lighting. In addition to reducing energy use, energy efficiency improvements also yield a variety of other benefits, including lower monthly utility bills and greater energy security.

**Space heating, cooling, and air conditioning (HVAC)** can include making use of natural ventilation and natural sources of heat, minimizing unwanted heat and humidity gains from lights and appliances, minimizing energy losses in conventional systems by upgrading equipment or downsizing the scale of the equipment, and integrating new efficient technologies.

**Lighting** energy use can be reduced in two ways: reducing the amount of artificial light required and using more efficient technology. Reducing light use can be achieved by behavioral changes—individual commitments to only keeping on the lights that are in use—or by using motion sensors, occupancy sensors, time sensors, and photosensors to automatically ensure that lights are only on when they are in use. Options for using more efficient technology include changing light bulbs and lighting fixtures from incandescent bulbs to fluorescents or solid-state lighting options.

\* Text adapted from the Pew Center on Global Climate Change: <http://www.pewclimate.org/technology/overview/buildings>

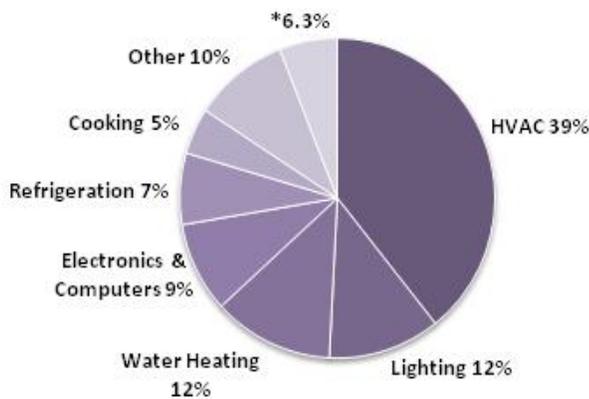
## Facts

Residential building energy use is driven by population and number of households. Nationally, the number of households is expected to increase by 25% from 2010 – 2030. In the Charlottesville-Albemarle County area, there are over 21,000 homes built before 1970 – the first year Virginia had code requirements for insulation!

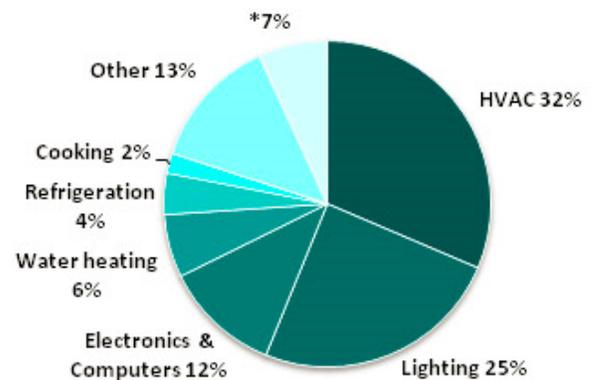
Virginia will be facing an energy shortage of 7,224 MW of power by 2020 without increased efficiency or new power generation. Energy efficiency is the **least** expensive “new” power generation at 3 cents per kilowatt, compared to 12 cents per kilowatt for a new coal-fired power plant.

The most cost effective energy conservation strategies are: behavioral induced changes (thermostat set points, turning off lights and electronics, etc.), air and duct sealing, and adding insulation. Upgrading heating and cooling equipment should be done *after* a professional energy assessment and improvements to the building’s shell are completed. Replacing windows can provide benefits; however, they usually have the longest payback of any energy improvement.

**Residential Building Energy Uses**



**Commercial Building Energy Uses**



## Tips and More Information

The Local Energy Alliance Program (LEAP) is our local nonprofit expert and one-stop shop for energy efficiency improvements that connects residents and commercial building owners interested in energy assessments and energy improvements for their structures with cash rebates, financing, and pre-qualified contractors. LEAP also offers programs and resources to assist low income residents, as well as free online home energy and peer comparison reports: <http://www.leap-va.org>

Dominion Power rebates: <http://www.dom.com/dominion-virginia-power/customer-service/energy-conservation/ec-programs.jsp>

Charlottesville Gas rebates: <http://www.charlottesville.org/index.aspx?page=2487>

Virginia Energy Department rebates: <http://www.dmme.virginia.gov/DE/ARRA-Public/ARRA.shtml>

Earthcraft Virginia and the James River Green Building Council are two organizations whose focus on new construction is to lower embodied energy and long-term energy use in buildings: <http://www.ecvirginia.org/> and <http://jrgbc.org/>