

VIII. ENERGY PLAN

Vision Statement

This Plan envisions Burlington as a city where...

...Burlington is a leader in the development and implementation of energy efficiency and renewable energy measures that reduce energy costs, enhance environmental quality, improve security and sustainability, and enhance economic vitality. Key elements of this success are a broad range of energy efficiency programs, public education in resource conservation, publicly-owned alternatively-fueled electric generation, biomass-fueled district energy technologies, energy-efficient green building technologies, and climate-friendly transportation solutions, which includes support for alternative fueled vehicles.

CITY POLICIES

THE CITY OF BURLINGTON WILL:

- **Optimize overall energy efficiency, reduce energy requirements, and minimize the need for new energy resources on a citywide basis.**
- **Continue to aggressively pursue the transition to renewable sources, cogeneration, and district heating.**
- **Improve the energy efficiency of city-owned buildings and facilities.**
- **Reduce transportation energy use by lessening reliance on drive-alone car trips, using more fuel-efficient vehicles, promoting increased transit use, and decreasing vehicle miles traveled.**
- **Educate its citizens regarding energy efficiency, the benefits of public utility ownership, renewable electric generation, and conservation to ensure that citywide resource allocation decisions in years to come will reflect the wishes of an informed citizenry.**
- **Make tangible efforts to reduce greenhouse gas emissions through the implementation of the *Climate Action Plan*.**

INTRODUCTION

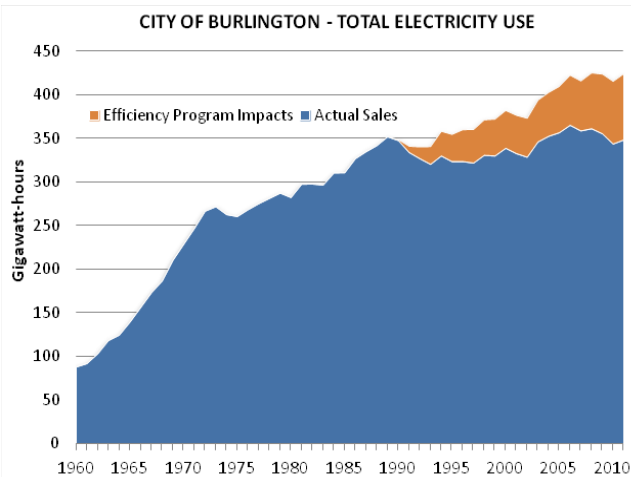
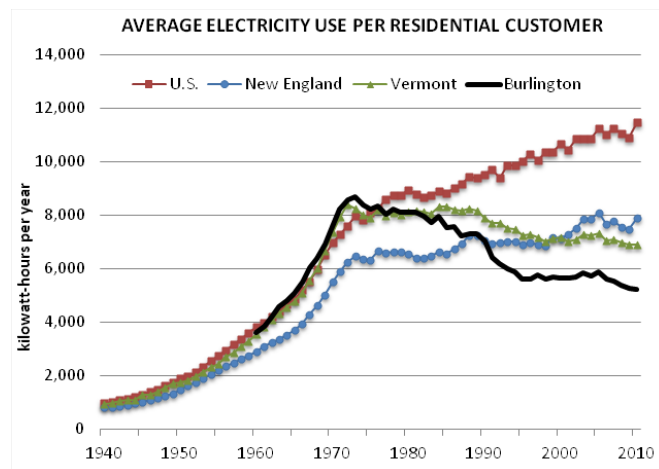
Access to reliable and clean energy, at an affordable price, will be an important factor in defining and facilitating future growth and development in Burlington. This Chapter briefly outlines how energy is used and supplied to the city, discusses some of the most important public policy issues related to energy generation and consumption, and finally proposes a series of strategies to improve efficiency, protect the consumer and the environment, and maintain energy self sufficiency. Much of the information and policy direction for this section comes from ***The Burlington Climate Action Plan*¹** adopted by the City Council in the winter 2014, and included as part of this plan by reference.

Energy Use & Supply

Nearly 85% of city residents rely on natural gas for space heating and domestic hot water use; typically the two largest users of energy in homes. Over 90% of commercial customers rely on natural gas for these purposes as well, however these buildings can use a good deal of electricity for lighting, central air conditioning, ventilation, and office equipment. Statewide energy use among fuels shows a dominance of oil in energy consumption. About 70% of Vermont homes use oil for space heating purposes.

In 1989, approximately 23% of homes and apartments in the city used electric space heating as the sole heating source and through the efforts of energy efficiency programs; residential electric heat use has been reduced down to about 5% of homes with electric heat as the sole heat source. These are typically buildings that do not have access to natural gas due to topography or subsurface conditions that make laying pipeline difficult.

Electricity is a high-quality power source, but to date has been inappropriate for space and hot water heating due to historically higher costs. Natural gas continues to be a more suitable heat source. Recent significant drops in the current and projected costs of natural gas make this unlikely to change in the foreseeable future. Oil on the other hand has seen continued price escalation. If the market for natural gas were to change materially however, this could need re-examination.



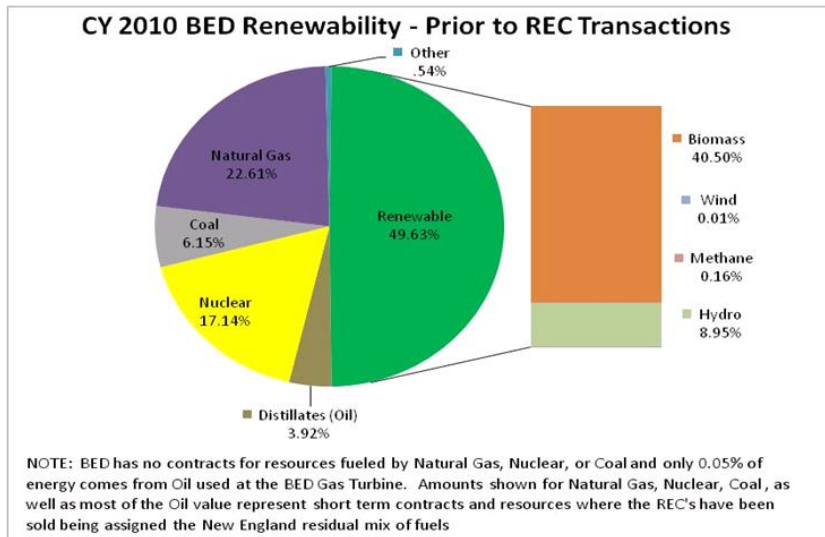
¹ 2014 Climate Action Plan Burlington, Vermont.

Burlington’s energy use priorities focus on developing more effective and economically viable Vermont based renewable energy alternatives including solar, wind and bio-mass energy sources, and a continued emphasis on conservation and efficiency programs. Energy efficiency has been shown to be Vermont’s least expensive future energy supply resource over time, and is consistently becoming a greater environmental imperative. The Burlington Electric Department is owned by all the citizens of Burlington, who have been unequivocally clear that the option for future supply that they prefer above all others is the pursuit of additional cost-effective energy efficiency.

BURLINGTON ELECTRIC

Burlington is fortunate to have a municipally-owned and operated electric company. Burlington Electric (BED) began in 1905, and currently serves about 16,300 residential customers and more than 3,600 commercial customers. BED serves the full range of energy services including generation, transmission, distribution, energy efficiency, and other retail energy services.

Burlington is a recognized world leader in the use of renewable energy and energy conservation. In 2011, Burlington as a whole used 4.7 percent less electricity than it used in 1989. The pie chart below shows the proportion of BED’s 2010 energy sources that came from renewable generation (this chart reflects the source of BED’s power, and does not reflect the change in BED’s emission claims caused by the sale of RECs as discussed below).

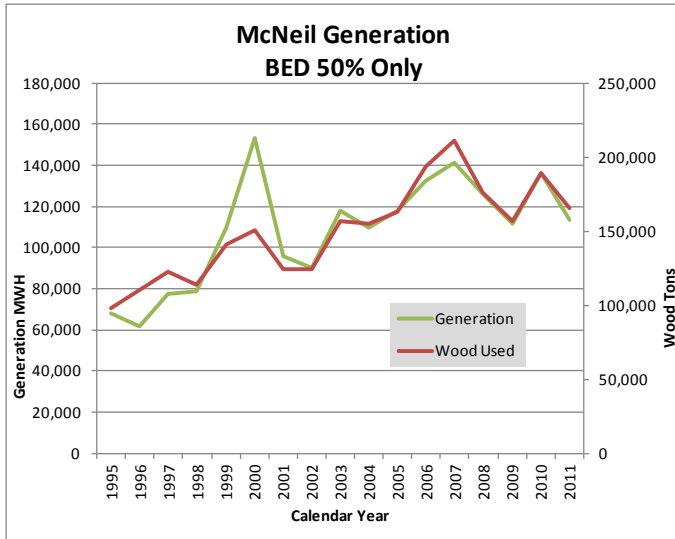


BED owns 50% of the 50-megawatt (MW) McNeil Generating Plant located in the Intervale. McNeil Station is one of the world's largest woodchip-fueled electric generating facilities. In late 2008 a new emission control system (a regenerative selective catalytic reduction or "RSCR" device) was installed which dramatically reduced McNeil’s nitrogen oxide (NOx) emissions. With the installation of this equipment, McNeil qualifies to sell Renewable Energy Credits ("RECs") to other states. When BED sells these RECs, BED loses the ability to claim McNeil as a renewable generating source, but is able to use the revenues from the sale of the



RECs to offset the cost of the emission control equipment and to help control rates. Since late 2008, BED has realized significant value from the sale of McNeil RECs and these revenues have been used to help maintain current rate levels.

The graph below summarizes the annual generation and tons of wood used at the McNeil Station. The difference between tons of wood used and generation in 2000 represents the last year where McNeil used significant amounts of natural gas to generate electricity (though the capability to do so still exists). The drop in output in 2011 is related to periodic maintenance that occurs on a seven year cycle.



In addition, BED owns a 25-MW turbine located next to the Water Treatment Plant on Lake Street. The gas turbine is a black start unit capable of cold-starting the McNeil Station as well as energizing critical load such as the Fletcher Allen Health Center.

BED has recently contracted for the full output from Georgia Mountain Community Wind (GMCW), a proposed 10 MW wind facility in Milton/Georgia, Vermont which went online at the end of 2012. Additionally, BED has signed and received voter approval for a long-term contract with Hydro-Quebec where deliveries will begin in 2015. Lastly, BED has received approval for a modification to its tariff to allow it to increase the benefits customers receive from solar net metering installations in recognition of the higher value of solar renewables to BED. BED continues to seek other power supply options including local generation. BED has the right to purchase (at fair market value) the Winooski One hydro facility on the Winooski River between Burlington and Winooski at the end of its current VEPP contract in March 2013. This facility is capable of producing 7.3-MW of power. Maintaining local energy self-sufficiency is an important component to Burlington’s future sustainability.

In addition to its own generation facilities, BED purchases power from a variety of sources and through the New England Power Grid. In determining where to purchase energy, BED considers the total social and environmental costs in its decision-making process. In 2012, approximately 50% of this power came from renewable sources and this percentage is expected to continue to grow when the new resources mentioned above begin deliveries. When BED’s Integrated Resource Plan (IRP) was filed in 2008, Burlington had a goal of providing 100% of its power from renewable sources. The new 2012 IRP revisited the 100% renewable goal in light of lower natural

gas prices and did support buying short-term renewable power contracts until cheaper long-term renewable sources could be found. BED continues to focus on a goal of 100% renewable supply and is continuing to seek cost effective options. In particular, a third wind contract is under consideration and BED hopes to soon purchase the Winooski One Hydro dam. If those two options work out as expected, BED will reach 100% renewability in 2014.

Advanced Metering Infrastructure (AMI)

The deployment of AMI is a technological advance that will change BED's business and operations in very fundamental ways. These changes will have a profound impact on the community, so BED is committed to working closely with its customers, other Vermont utilities, regulators and legislators to arrive at solutions that provide the best benefit to the Burlington energy consumer.

BED partnered with other Vermont utilities and the Department of Public Service ("DPS") to develop and submit a statewide grant application to the Department of Energy ("DOE") to obtain Smart Grid Investment Grant ("SGIG"), funding. The funds awarded to all participating Vermont utilities totaled \$69 million of a \$138 million project (100% of the requested amount). The DOE awarded BED \$7.15 million for a \$14.3 million total project (again 100% of the requested amount). The full Federal matching funding received by BED reduced BED's direct cost for its Smart Grid projects by 50%. On June 28, 2011, BED sought voter approval to issue Revenue Bonds to obtain matching funds for the projects, which resulted in approval of the bond issuance by 61% of Burlington voters. BED closed on the sale of the Revenue Bonds on October 13, 2011. BED initial phase of advanced meter deployment began on April 23, 2012 and finished in early 2013.

BED's AMI plan centers on its ability to improve system planning/reliability, improve customer service, empower customers to engage in choices regarding their use of energy, and possibly modify their usage to reduce costs. BED has defined a list of service offerings and utility enhancements that will result from the AMI project.

The selected technologies will have the ability to provide immediate customer and societal benefits as well as the potential for future benefits as the systems and service offerings mature. These benefits are derived from the enhanced data collection, communications and process integration capabilities provided or enabled by the proposed AMI Project. Over the longer-term, use of AMI (integrated with a Meter Data Management System) for time-of-use pricing or other pricing options, will allow customers to the option to adjust consumption decisions based on the day-to-day (or potentially even hour-to-hour) price of electricity and its impact on their bills.

With a fully active system, BED can:

- Dispatch crews to outages without waiting for customer calls (while minimizing manual handling of outage information)
- Give customers much greater insight into how they use electricity via a web portal
- Reduce the need to send trucks into the field for move-in and move-out meter readings
- Have much more information to assist in answering customer questions
- Develop more accurate class level load forecasts
- Be able to develop much more personalized energy efficiency programs (including better estimates of potential savings)
- Be much more accurate in our distribution transformer and conductor sizing
- As a side benefit, automate many of the manual functions performed every day, giving staff more time to focus on customer needs and more tools to fix problems

BED believes the following benefits are possible to the consumer as a result of this new technology:

- Expanded integration of distributed renewable energy
- Access to data needed to support time differentiated electric rates in more detail than is currently possible
- Capability to connect power consuming appliances in the home to load control devices if customer's desire
- Opportunity to reduce fossil fuel use by converting fossil energy sources to electric based renewable sources
- Remote access home usage and ultimately remotely control appliances/usage
- Allowed access to third party services to better manage their usage and load control (e.g. Google)

District Heating & Cooling/ Community Energy

BED, in conjunction with the Department of Public Works, continues to study the feasibility of developing district heating and cooling, or now known as "District Energy," within portions of the city. Areas under evaluation begin with the Winooski Avenue corridor all the way to the downtown. Although not under consideration at this time, the concentration of industrial land uses along Pine Street may make this area another attractive location to provide this type of service.

The concept for District Energy is to replace natural gas and fuel oil as heat sources with hot water. Such a plan will utilize excess city water capacity, combined with energy and excess/low cost heat produced by McNeil Station. Energy would be distributed underground to either heat or cool buildings within the district. If feasible, district heating and cooling is expected to provide a viable energy alternative, make use of existing water capacity, diversify the city's energy mix, and make the city a more attractive and competitive location for business.

Energy Efficiency Programs

BED began an ambitious energy efficiency program in 1990. Over \$37 million has been invested by BED since 1991 with about half of this being matched from BED customers. BED has implemented a wide range of programs to reduce overall energy consumption and costs through the city. These included:

- **Smartlight:** leased compact florescent energy saving light bulbs to both residential and commercial consumers. In the near future, this may include other items financed on the electric bill.
- **Heat Exchange:** offers assistance and financial subsidies to convert customers from electric heating to other heating sources. Over time, as legislation in this area evolves, BED will become increasingly more involved in the growth of fossil fuel saving energy efficiency programs as well.
- **Commercial Efficiency programs:** offers a customized menu of energy savings opportunities to the City's commercial electric customers to provide "positive cash flow" financing of demand-side management measures.
- **Energy-Efficiency Standards:** adds additional requirements to those minimum standards adopted at the statewide level for buildings and energy-consuming

equipment in new construction and rehabilitation projects. These go hand in hand with incentive programs to help building owners, architects, developers, and even tenants to achieve higher levels of energy efficiency.

- **PACE:** is an innovative residential energy efficiency and renewable energy financing program that was launched in 2012. It offers residents a way to finance high-level energy efficiency and small-scale renewable energy projects over very long terms, making these projects more affordable.

In 2000, BED was appointed the City's "energy efficiency utility." This designation allows BED to administer funds collected on the electric bill through a statewide "energy efficiency charge." This appointment was renewed in 2011.

Energy Use and Climate Protection

Most climatic scientists now agree that human-caused emissions of greenhouse gases² are having a measurable impact on the earth's climate. While increases in global temperatures are highlighted as one of the primary outcomes of climate change, many impacts that are more serious may result. These include an increase in the frequency and intensity of extreme weather events, rising sea levels, and a northward expansion in the range of tropical diseases and pests. Each poses a significant economic and environmental threat to our region and beyond.

In 1996, Burlington became one of the first cities to join the "Cities for Climate Protection" campaign, organized by what is now referred to as "ICLEI: Local Governments for Sustainability." This led to a 1998 City Council resolution to reduce our emissions to 10% below 1990 levels and the formation of a Climate Protection Task Force. This group, comprised of non-profit, city, and business leaders appointed by then Mayor Peter Clavelle, guided an 18-month analysis and planning process, which ultimately led to the City's first Climate Action Plan (CAP). This plan was adopted by the City Council in May 2000.

In 2008, Burlington began its CAP update and review process with an inventory of Burlington's emissions. This inventory, conducted using ICLEI's Clean Air and Climate Protection (CACP) software, involved input, not only from key City departments such as Burlington Electric Department (BED), Department of Public Works (DPW), and Department of Planning and Zoning (DPZ), but other organizations such as the Chittenden Solid Waste District (CSWD) and the Regional Planning Commission.

GHG emissions reduction target:

The first short-term target requires leveling off the emissions by 2016 and bring them back to 2010 levels. The second target involves an actual reduction of the 2010 emission levels by 2025:

- Municipal Operations - 20% reduction from 2010 levels by 2025.
- Airport Operations - 10% reduction from 2010 levels by 2025.
- Community-Wide - 10% reduction from 2010 levels by 2025.

² "Greenhouse Gases" are any gas found in the earth's atmosphere that contributes to trapping energy under the atmosphere and causing warming. Such gases include carbon dioxide, methane, ozone, nitrous oxide, chlorofluorocarbons (CFC's) and water vapor.

Recommended actions propose to reduce traffic and air pollution, save money for the City and its residents and businesses, and help protect the environment for future generations. After a lengthy public idea generation and prioritization process, thirty-six strategies have been included in the plan under the following eight categories:

- Compact Mixed-Use Development
- Community-wide Transportation
- Municipal Transportation
- Local Gardens, Farms and Food Production
- Energy Efficiency in Buildings
- Renewable Energy Resources
- Urban Forestry & Carbon Sequestration
- Waste Reduction and Recycling

In addition to reducing greenhouse gas emissions, the recommendations of this Plan will benefit the city in other ways:

- **Cleaner air:** Motor vehicles are the single largest source of urban air pollution. In addition to greenhouse gases, cars emit such carcinogens as butadiene, benzene, and formaldehyde.
- **Improved human health:** Cleaner air will result in healthier people. An estimated 40,000 premature deaths nationally are attributed to motor vehicle emissions.
- **Improved economic vitality:** Improvements in energy efficiency mean tangible cost savings to individuals and businesses. Energy independence keeps local dollars in the local economy and improves the competitiveness of local businesses.
- **A more livable community:** A city with less traffic, cleaner air, more trees, and successful businesses will be a more attractive and livable place to live for current and future generations.

Energy Action Plan

Action Item	Lead Agency	Secondary Agencies
Sponsor forums for architects, developers, contractors, and others to inform them about new city ordinances, regulations, and standards and to provide technical assistance as to how they can incorporate new analytic and production techniques in their work	BED	Public Works
Review vocational curricula to promote energy efficiency and to develop programs to prepare students for employment in new energy-related fields.	BED	Schools
Develop an overall energy budget to manage the city's energy consumption. For electricity, the budget should be based upon local generating capacity if practical.	BED	

Examine the costs and benefits of requiring new development to either pay an energy impact fee or make an offsetting investment in efficiency.	BED	Planning & Zoning
Prepare an evaluation of the citywide potential, constraints and impacts associated with the development of new renewable energy sources - including fuel cell, cogeneration, biomass, solar, geothermal, hydro, wind, and methane.	BED	
Develop guidelines for tree heights and species selection that maximize energy efficiency.	Parks & Recreation	BED
Amend and enforce the municipal code and ordinances with an eye on reducing CO2 loads.	Planning & Zoning	BED
Develop a comprehensive education/outreach program to increase public awareness about the affects of global climate change on public health, the economy and the environment.	BED	Planning & Zoning Public Works Schools
Expand and maintain the City's inventory of street trees and shrubs.	Parks & Recreation	
Fully implement existing utility sponsored efficiency programs (electric and natural gas) in the commercial and industrial sectors.	BED	
Increase energy efficiency in municipal-owned and leased buildings.	Treasurer's Office	BED Public Works Schools
Explore and to obtain the resources necessary to implement the objectives of the municipal buildings and operations plan.	Treasurer's Office	BED Public Works Schools