Energy Chapter for Temple Master Plan
(2010)

Introduction

The purpose of the Energy Chapter is to connect Temple's land use policies and vision with the goals approved by our citizens in Warrant Article 16 at the 2007 Town Meeting—"to save energy and reduce green house gas emissions."

It will serve to guide Temple toward lowering its overall energy consumption in the community, thereby reducing both its overall energy costs and the release of environmental pollutants.

It will further address the issues of energy stability and sustainability for our community to reflect the lessons learned from the costly and devastating Ice Storm of 2008.

State Statutes Related to Energy and Planning

State Statutes outlines the purpose of land use regulations which are implemented by Planning Boards. Pertinent sections which relate to environment and energy include the following two sections:

> RSA 672:1
>
> III. Proper regulations enhance the public health, safety and general welfare and encourage the appropriate and wise use of land."
>
> III- a. Proper regulations encourage energy efficient patterns of development, the use of solar energy, including adequate access to direct sunlight for solar energy uses, and the use of other renewable forms of energy and energy conservation. Therefore, zoning ordinances should not unreasonably limit installation of solar, wind, or other renewable energy systems or the building of structures that facilitate the collection of renewable energy, except where necessary to protect the public health, safety, and welfare."

New Hampshire Climate Action Plan

The 2009 NH Climate Action Plan was developed by the state-authorized, bi-partisan Climate Change Policy Task Force that was composed of representatives from all sectors of the NH community. It aims at achieving the greatest feasible reductions in greenhouse gas emissions while also providing the greatest possible long-term economic benefits to the citizens of New Hampshire.

It concluded that the most significant reductions in both emissions and costs will come from substantially increasing energy efficiency in all sections of the economy, continuing to increase sources of renewable energy and designing our communities to reduce reliance on automobiles for transportation. The Climate Action Plan recommends that New Hampshire strive to achieve long-term reductions in greenhouse gas emissions of 80 percent below 1990 levels by 2050. The Climate Change Policy Task Force also recommends 67 specific actions to achieve the following goals:

- Reduce greenhouse gas emissions from buildings, electric generation, and transportation;
- Protect natural resources to maintain the amount of carbon sequestered;
- Support regional and national initiatives to reduce greenhouse gases;
- Develop an integrated education, outreach and workforce training program; and
- Adapt to existing and potential climate change impacts.

It is envisioned that with participation from all communities, the NH Climate Action Plan will benefit the economy, increase state and regional energy security, and improve environmental quality. In order to meet the recommended goal of reductions in GHG emissions statewide, it states that NH communities must engage in local energy planning that includes strategies for decreasing their emissions overall.

Energy Efficiency and Conservation

Energy conservation is the wise use or management of energy. Energy efficiency refers to achieving a desired goal, such as powering a building, while reducing the amount of energy used in the process. Reusing, reducing, and recycling are also essential aspects of the conservation equation. Energy savings can be achieved through energy efficiency measures that reduce the amount of energy used for a task or through substituting technologically more advanced equipment to produce the same level of end-use service.

Temple's municipal efficiency lighting upgrade in 2007 and the retrofitting project for our Municipal Building/FD and Mansfield Library are excellent examples of energy efficiency measures which will save energy and lower the tax burden. Another efficiency measure is to simply use less energy through behavioral changes. These can be encouraged through energy conservation education within the community and the adoption of upgraded zoning ordinances and town regulations. Examples are: 1) weatherizing our buildings and homes 2) turning off electrical equipment and lights when not in use; 3) installing programmable thermostats to reduce energy loads when buildings and homes are not in use; 4) purchasing Energy Star equipment; 5) walking and biking instead of driving when possible; 6) adopting a no-idling policy for appropriate municipal vehicles; 7) recycling, composting, line drying laundry, ride-sharing, trip reduction, installing CFLs, etc. 8) reusing and refurbishing buildings rather than removing them to build new ones; and 9) facilitating the establishment of home businesses to reduce commuting through upgraded zoning ordinances and increasing the availability of high speed Internet service throughout the town. Creating local requirements that exceed the State Energy Code is also worth considering. This would require setting the standard for new structures in Temple higher than that required by the Code, and as a result getting units that use less energy and are cheaper for the users to operate annually for no additional construction costs. Overall, energy efficiency is achievable by a combination of all the conservation and efficiency measures.

Planning for Our Community

Reducing energy consumption has been part of good planning for several decades. Smart growth has become a buzzword and has many components which address energy conservation measures, such as mixed use-development, compact village centers, reducing the number and length of vehicle trips between shopping areas and where residents live. Similarly, alternative transportation reduces vehicular traffic and subsequently carbon dioxide emissions. What is newer to community planning is the regulation of resources used to construct and power buildings and upgrading municipal systems to more efficient models.

Temple's 2008 energy-focused land use audit overlapped with the goals of smart growth and other natural resource oriented efforts. The intention of its findings and recommendations was to suggest that our town find ways to foster development patterns that use land in town efficiently, while protecting natural resources and reducing residents' reliance on energy from fossil fuels. Energy and climate change issues need to be considered as factors in planning for development in a manner similar to natural resource planning. It would be reasonable and prudent for Temple to take this long range view as it engages in its planning efforts.

Although the rate of growth in Temple is fairly low, we are currently promoting a pattern of low density residential sprawl that is very auto-dependent.

The 2008 audit process also identified inconsistencies, from an energy perspective, between the Master Plan and the Zoning Ordinances, Site Plan Regulations, and Subdivision Regulations. Its purpose was to ensure that development could be fostered that would reduce energy consumption, particularly from fossil fuel sources. So where inconsistencies exist, it is important to address them before it is too late to achieve the stated vision of the Master Plan. **If the ordinances do not assist with the implementation of the Vision in the Master Plan, that Vision is not likely to be achieved.**

There are also policy elements of the Master Plan that actively promote consumptive patterns of development. These need to be addressed to reflect the citizen-approved 2007 Warrant Article specifying Temple's intention to conserve energy and reduce greenhouse gas emissions. Our landscape of natural resources, including farm and forest lands, is critical to our community's long term sustainability. Many of these resources ensure clean drinking water, a sustainable fuel source, and are supportive of our produced food. Although the rate of growth in Temple is fairly low, we are currently promoting a pattern of low density residential sprawl that is very auto-dependent and relies largely on the surrounding communities for services. This suburban pattern of development could change Temple in significant and costly ways over time, and eliminate many of the natural resources residents treasure now and will need in the future.

Two items that appear to need attention in the near future are:

-***Land Use Patterns*** – Nodes of mixed use development (residential, commercial, and civic uses) surrounded by lower density clusters of residential development and natural resources would allow for reduced travel requirements--reduced fuel usage and costs.

-***Mix of Uses*** - Again, a greater mix of uses at key locations (like the Village) would allow for a reduction in vehicles trips, and would encourage walking and biking. It would also create a greater density of activity that might warrant a future transit stop or a simple park- and- ride option for our residents.

Renewable Energy

Considerations in Our Region:

The NH Office of Energy and Planning estimates that, on average, at least 85% of our state's heating energy comes from imported sources. This nonrenewable fossil fuel based energy accounts for 69% of total energy use in the state, while the cost of petroleum products has been increasing since 2005, and the average resident consumed 9% more energy in 2004 than in 1990. (See the Appendix for relevant charts and graphs.)

Since 2005, along with the petroleum price increases, the average electricity price per kilowatt hour has been increasing steadily. The five cent increase from 2005 to 2008, for instance, from $0.11 to $o.16 is actually a 45% increase. Since electricity makes up a large percentage of the energy use in the Monadnock region, this results in a dramatic increase in energy costs for Temple residents and businesses.

The University of New Hampshire has been a leader in researching the impacts of climate change for our region. It has determined that the weather in NH has become wetter, more extreme, and warmer overall. Looking into the near future, climatologists have predicted an increase in damaging storms for the Northeast, including more ice storms for NH, as a result of the changes in our climate.

Since Temple and the rest of the Monadnock region are primarily reliant on fossil fuels to meet their energy demands, it is important to acknowledge a number of realities. The global supply of fossil fuels is dwindling; their costs are volatile and have been rising overall; these fuels need to be imported to NH from other states or countries; their use becomes limited to fueling generators during power outages; and they are harmful to the environment. For these reasons, Temple needs to establish a more diverse supply of energy sources--ones which are reliable, affordable, and environmentally responsible.

Renewable Energy for Temple:

As a consequence of the devastating Ice Storm of December, 2008 with its 14-day power outage in Temple, the value of diversified and "off the grid" energy sources to provide stability during such emergencies became clear.

Renewable energy sources offer that stability.

- They can provide energy assurance by adding diversity and independence from centralized grid outages.
- They are inexhaustible, though sometimes limited in the energy available per unit of time.
- They provide long term energy security, because indigenous energy sources are not subject to geopolitical influences.

Renewable energy sources' additional benefits:

- They provide environmental protection by reducing pollution and other negative impacts on air, water, and land while meeting energy demands in ways that can be maintained indefinitely.
- They provide opportunities to create economic stability and growth. Renewable technologies retain dollars in-state, create new jobs, and stimulate local and regional economies.

Since 2007 an increasing number of renewable energy incentives have became available from the state and federal government as well as from some utilities. These programs are anticipated to be expanded over time, and could greatly reduce the upfront cost for small-scale installations. Similarly, the NH Regional Greenhouse Gas Initiative (RGGI) is providing municipal grants to support both energy efficiency projects and installations of renewable energy systems. In 2010, the NH Community Development Finance Authority (CDFA) established a revolving loan fund for municipal energy efficiency projects and installations of renewable energy systems. Their loan agreements facilitate a financing process for municipalities which is geared to be readily workable and structured to be "cash neutral"--repayable solely through energy savings.

While there are a host of benefits from renewable energy installations, including reduced emissions and decreased transmission losses via the use of a decentralized energy grid, there are a few potential negative impacts to consider. Placed in certain locations, wind turbines can produce a noise disturbance, impact wildlife habitat, and create visual changes to the landscape. Both the positive and negative impacts need to be weighed before educated decisions can be made about the expanded use and locations of renewable energy systems in Temple.

Transportation

Since transportation constitutes such a large portion of energy usage and costs for Temple residents and municipal operations, there are references to it embedded throughout this chapter. In a nutshell, until there is either an adequate supply of affordable hybrid or energy efficient vehicles on the market or a plentiful supply of affordable, safe and sustainable non-

fossil based fuels to run our vehicles, the only ways to reduce vehicular energy usage and emissions are to travel less and to make better use of alternative transportation.

Temple's 2010 zoning ordinance upgrades, designed to positively impact the options for home businesses, will help to serve that end. The efforts underway to increase high-speed Internet service throughout the town add further support for home businesses. Residents also need to be encouraged to utilize the existing public transportation services and ride sharing programs such as the CVTC and the Boston-Nashua Express Bus service. Installing walking and bike paths in town would also reduce vehicular fuel consumption locally.

One of the most effective actions we could take to reduce some of the need for traveling out of town would be to expand the number and quality of conveniences and activities available in our own village area, where and when possible. It is helpful that Town Hall is being used for an increasing number of meetings and events and that the Village Green is used for the Harvest Festival, the Half-Marathon, the Farmer's Market and other activities. It is advantageous for many reasons that Temple's own Farmer's Market was established in 2009 for our many farmers, bakers and craftspeople to showcase their produce and wares while our residents gain an enjoyable local shopping option. Sustaining it will add to the benefits and quality of life in Temple well into the future.

Recommendations

There is no simple answer to stabilizing energy issues and their environmental impacts. Through implementing a combination of available solutions, our community can play a direct role in reducing its energy use and in controlling its impact on the environment. Temple can encourage different scales of renewable energy generation, improve energy efficiency in the built environment, and continue to promote smart growth principles that concentrate development in the village area where feasible. These efforts will improve the efficiency of the community, support a sustainable environment, and reduce fuel costs and the tax burden.

Below are suggested actions for Temple to implement as we work toward reducing greenhouse gas emissions and energy usage within our community.

Initiating, Acting Agent	Potential Actions
Planning Board	▪ Implement the viable policy recommendations from the 2008 energy audit of the Master Plan and Zoning Ordinances. Most notably, this involves the challenge of eventually expanding the uses available in the village center to encourage local activity and reduce travel.
Planning Board	▪ Adopt ordinances that encourage and improve energy efficient private development including green building design and small wind, geothermal and solar energy systems.

Planning Board, TEEC, BOS	▪ Adopt energy conservation and efficiency measures for municipal buildings and operations. This could include creating local energy building requirements that exceed the State Energy Code.
BOS and TEEC	▪ Reduce barriers to, and promote the development and installation of appropriate thermal and electric renewable energy sources in all sectors of the community.
BOS and TEEC	▪ Implement a municipal buying strategy of Energy Star equipment and eco-friendly office products, as costs permit, and implement awareness campaigns to encourage the consumption of such equipment and products within the broader community.
BOS and TEEC	▪ Join with nearby towns to form a single, eco-friendly purchasing contract to provide economy of scale for all.
Highway Department and TEEC	▪ Evaluate ways to reduce fuel usage with Temple's vehicle fleet – analyzing routes, usage, and creating a strict anti-idling policy where feasible.
Town Meeting and TEEC	▪ Create an Energy Savings Trust Fund to be used in the future for energy saving initiatives within a 5 year payback. Submit this Fund for majority vote at a Town Meeting.
TEEC	▪ Encourage residents to reduce, reuse, recycle, and compost, as well as to use clotheslines and wooden drying racks to reduce the energy usage of clothes dryers. ▪ Encourage car pooling, ride-sharing, bike riding, and the use of mass transit where possible. ▪ Promote voluntary efforts to insulate buildings, homes and businesses and replace incandescent bulbs with energy efficient lighting, etc. to reduce the amount of energy consumed for heat and electricity.

APPENDIX

Temple Municipal Energy Use

In 2008, a municipal energy inventory of Temple's energy usage and energy costs for the year 2005 was conducted by the Temple Energy Committee and then processed and analyzed using the Clean Air Climate Protection software and the EPA Portfolio Manager Benchmarking software. The results of the inventory and analyses were compiled in a Municipal Inventory Report, presented to the Select Board and available for residents to read at Mansfield Library. The following tables summarize the energy usage, cost and emissions associated with Temple's various municipal sectors, buildings and operations in 2005.

Table 1 - Energy use, equivalent carbon emissions[1], and costs, by municipal sector

Municipal Sector	Energy Use (MMBtu)[2]	Energy Use (%)	Equiva-lent CO_2 (tons)	Equiva-lent CO_2 (%)	Energy Cost (US$)	Energy Cost %
Municipal Buildings	1,033	48	59	37	13,046	41
Vehicle Fleet	1,129	52	98	62	18,219	57
Street Lights	1	0	0	0	96	0
Water & Sewage	0	0	0	0	0	0
Waste	0	0	2	1	630	2
Total	**2,163**	**100**	**159**	**100**	**31,991**	**100**

Source: Temple Municipal inventory, 2008
Generated by CACP Software

[1] According to the Clean Air and Climate Protection software, "Equivalent CO2 (eCO2) is a common unit that allows emissions of greenhouse gases of different strengths to be added together. For carbon dioxide itself, emissions in tons of CO2 and tons of eCO2 are the same thing, whereas for nitrous oxide, an example of a stronger greenhouse gas, one ton of emissions is equal to 310 tons eCO2."
[2] The Clean Air and Climate Protection software presents energy use in MMBtus, which is one million British Thermal Units, a common measure of energy consumption (see www.energyvortex.com/energydictionary/british_thermal_unit_(btu)_mbtu_mmbtu.html).

Name of Building	Energy Use (MMBtu)	Energy %	CO2 emissions (tons)[3]	CO2 %	Energy Cost (US$)	Energy Cost %
Town Hall	80	8	8	15	2,058	16
Muni Bldg - Fire	379	37	30	58	6,898	52
Library	143	14	11	21	3,215	25
Town garage	430	41	3	6	876	7
Total	**1032**	**100**	**52**	**100**	**13,047**	**100**

Table 2. Carbon emissions, energy use, and costs, by municipal building

Source: Temple Municipal Inventory, 2008
Carbon data generated by EPA Portfolio Manager Program; energy use generated by CACP software.

The tables above indicate the vehicle sector is the most significant sector in Temple in terms of energy use and energy cost, and especially in terms of carbon equivalent emissions. The vehicle sector comprised 52% of energy use and 57% of energy costs, but a full 62% of emissions. The building sector is the only other significant energy sector in Temple, using 48% of the energy and comprising 41% of the energy costs, as well as contributing 37% of the carbon equivalent emissions. For the municipal sector in Temple, the town's four buildings and thirteen vehicles offer the greatest opportunities for energy savings.

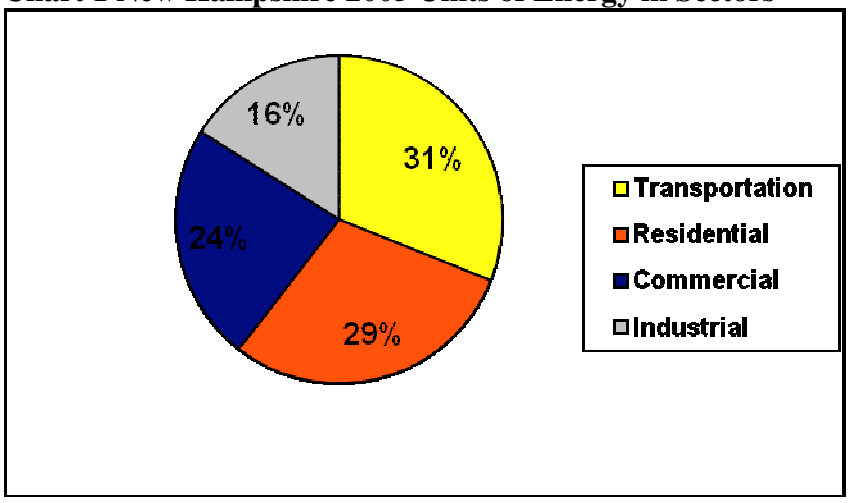
In terms of buildings, the highway department garage and the Municipal Building/FD used the most energy at 41% and 37% respectively. The library and Town Hall used less energy at 14% and 8%, respectively. However, the town garage had very low energy costs and carbon emissions relative to the amount of energy used, as it only accounts for 6% of carbon emissions and 7% of the energy costs despite occupying 41% of the energy use. This was due to the fact that it largely burns wood, which is low in carbon emissions and obtained free from local downed trees. The Municipal Building/FD, on the other hand, accounted for a full 58% of the carbon emissions and 52% of the energy costs despite occupying only 37% of the energy use. The library, with 14% of the energy use, occupied 21% of the carbon emissions and 25% of the energy costs. Town Hall, with the relatively small 8% of energy use, accounted for 15% of carbon emissions and 16% of costs. The library, Town Hall, and Municipal Building/FD have higher proportions of carbon emissions compared to their share of energy use. As stated above, a closer look at the data would explain that the proportions of energy use, emissions, and costs are affected by the fact that the town garage used primarily wood heat which was obtained cost free to the town. Wood heat provides a larger amount of energy with lower carbon equivalent emissions.

Regional and Community Energy Use

A regional energy and greenhouse gas assessment was conducted for the Monadnock region. The Monadnock Region is geographically defined by Southwest Region Planning Commission's (SWRPC) Planning District. The regional assessment is based on the 2005 facts and figures from the New Hampshire state inventory that was derived from the Energy Information Administration (EIA). The EIA evaluates residential, commercial and industrial buildings, transportation, and electricity production. The regional assessment included the figures and information on the relevant sectors for the Monadnock region. These sectors included residential, commercial, industrial, transportation as well as a section on waste.

For the purposes of the regional assessment, electricity was included as an end use factor versus being separated out in electricity generators, since there are no electricity generator facilities in the Monadnock region and it was important to look at end use in buildings.

Chart 1 New Hampshire 2005 Units of Energy in Sectors



As shown in the chart above, transportation is the largest consumer of energy as well as the largest producer of CO2 in the state of New Hampshire. After transportation, residential uses are second largest consumer of energy and producer of CO2 followed by the Commercial and Industrial sectors. Finally, waste accounts for a nominal amount of the energy consumption and CO2 emissions in the region and is not depicted in the state energy chart. It is important to note that if you combine Residential, Commercial and Industrial sectors together, which accounts for buildings, the buildings sector constitutes 69% of energy usage and CO2 emissions. These figures and percentages fairly represent the Monadnock region's energy portfolio. The state inventory indicates that oil and electricity are the main sources of energy in the residential and commercial sectors. In the industrial sector, the highest energy usage is electricity.

In Temple, commercial square footage is very small compared to residential square footage. Industry is also absent in Temple. Therefore, the two primary sectors of concern for the Temple community are transportation and residential buildings. Within these two sectors, heating oil, electricity and vehicle gasoline are the dominant forms of energy.

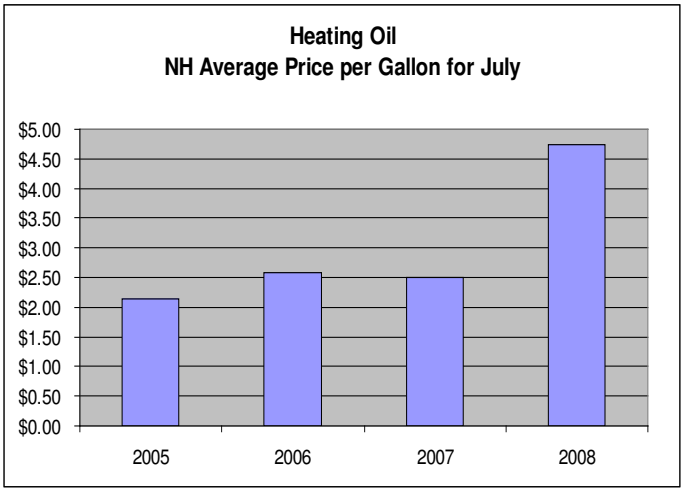
New Hampshire Energy Supply

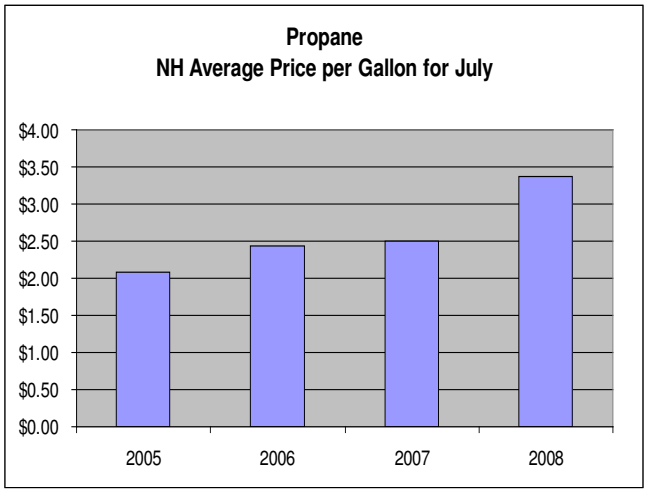
As stated in the main text of the chapter, nonrenewable fossil fuel based energy accounts for 69 % of the total energy use in New Hampshire. The gross energy use includes all of the energy imported into the State, plus all of the energy produced with resources from within the state. The calculation of gross energy use is important to consider because the production of energy, regardless of where it is ultimately used, has economic and environmental ramifications.

In 1990, total energy consumption in New Hampshire was 264.6 trillion British Thermal Units (BTU) and the state population was 1,109,117. On a per capita basis, each resident consumed 239 million BTUs. By 2004, the energy consumption grew by 28.7% to 340.6 trillion while population grew only by 17.1%. The energy consumption per capita in New Hampshire rose to 262 million BTUs. Thus, the average resident in New Hampshire consumed 9% more energy in 2004 than they did in 1990.

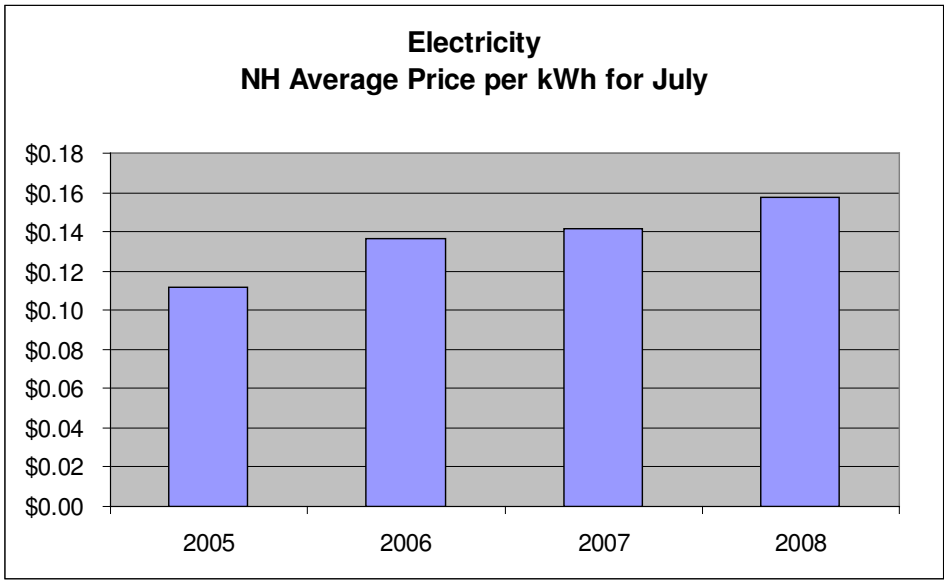
There is a heavy reliance on petroleum products in NH, the region and the nation. The percentage of natural gas contribution toward total energy consumption varies minimally between the state, region and nation. However, both New England and New Hampshire are more reliant than the United States on natural gas as a fuel source for electricity. Regarding coal, there is also a difference across these three geographic regions. Across the United States, coal produces close to 50% of the country's electricity. However in New England, it drops to a mere 15.1% and only slightly higher numbers in New Hampshire.
At 17.1 %. Nuclear in NH is substantially larger than the U.S. because of the Seabrook nuclear power plant. This is less revealing, because the electricity from that plant enters the New England power grid and the electricity from Seabrook is not necessarily confined to being used in New Hampshire. As a matter of fact NH exports 34.2% of the energy generated in the state.

Graph 1 and 2 NH Average Heating Oil and Propane Price per Gallon July 05-08





Graph 3 NH Average Electricity Price per kWh July 2005-2008



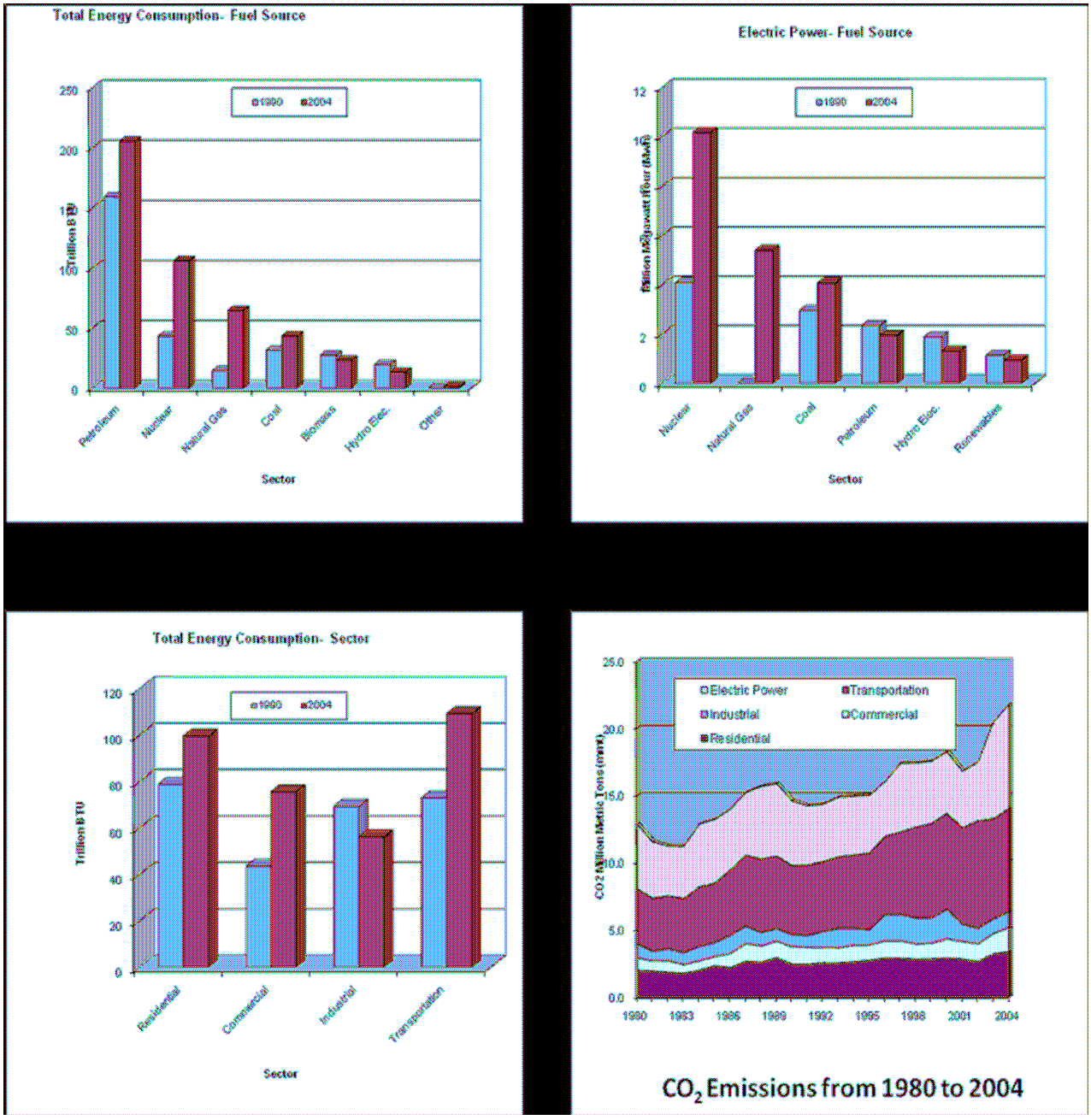
Regarding electricity, rates in New England are substantially higher than the national average, which is largely due to the limited availability of coal to the New England region. Coal is an affordable fuel source for many areas with rich deposits of the mineral, but New Hampshire is not one of these regions. It is also important to note that this lower cost does not take into consideration the significant damage to human health and the environment that are frequently linked to coal. The result in New Hampshire is a heavier reliance on natural gas and nuclear for power generation. As stated in the main text of the chapter, although it may not seem like a lot, the five cent increase in the cost of electricity from $0.11 to $0.16 since 2005 is actually a 45 % increase. Given the fact that such a large percentage of the energy use in the Monadnock region is from electricity, this will result in a dramatic increase in energy costs for residents as well as businesses in this region.

It is important to note that these rate increases for electricity were prior to and independent of any impact from the Regional Greenhouse Gas Reduction Initiative (RGGI) Cap and Trade program. In New Hampshire, the RGGI program did not become operational until 2009, a year later than the 2008 statistics used in this report. Furthermore, it has been clearly documented that the Cap and Trade system being used in New Hampshire to regulate the RGGI program will have only a minimal effect on potential rate increases for our electricity in Temple. It has been shown in numerous studies and analyses that when the money from a Cap and Trade program is reinvested in energy efficiency programs and projects within a state, rather than used to reduce utility rates, it stimulates the economy, produces more in-state jobs, and decreases the tax burden

on residents through lower municipal utility costs. It is an overall economic gain, rather than a financial detriment for utility consumers.

The NH Climate Action Plan calls for a reduction in emissions of 20 percent below 1990 levels by 2025, and 80 percent below 1990 levels by 2050. In order to meet these reduction goals statewide, NH communities must engage in local energy planning that includes strategies for decreasing their emissions overall.

Energy use and carbon dioxide emissions by energy sector in New Hampshire from 1990 to 2004 [Source: New Hampshire Climate Action Plan (2008)]



Renewable Energy Use by Type and Sector in New Hampshire

As the charts below indicate, the two largest sectors using renewable energy in NH are electricity generation (47%) and industry (40%).