

# ENERGY EFFICIENCY, RESILIENCY, AND SUSTAINABILITY

DURHAM, NH MASTER PLAN, 2011-12

The Energy Chapter of the Master Plan will present a vision to guide our efforts around energy use for the next ten year period, a brief introduction to energy related steps completed or begun since the first master plan, and finally a series of most important issues (with goals, objectives, recommendations, and measurement metrics) for achieving its overall vision of joining the ranks of the nation's most resilient, efficient, and environmentally responsible municipalities.

## VISION

As Durham looks to the challenging facing it and its fellow communities in the next 10, 20, and 50 years, one of its very top priorities is to realize its vision of becoming a leading exemplar of sustainability, resilience, and environmental best practices. No mere bragging right, progress toward achieving this vision will fundamentally affect the town's capacity to survive, adapt, and grow in the face of expected and unanticipated developments in our nation's energy supplies, environmental conditions, and the international economic landscape.

As Durham moves further into the 21st Century, it faces a challenge shared across the country: our increasing reliance on fossil fuels left us vulnerable as that energy source becomes more scarce and more costly. The cost of securing fossil fuels from foreign sources – in lives and dollars – has risen at an alarming rate in the decades since the original 1979 oil crisis. We also share the specific challenges of towns in less densely populated regions and/or cold climates: high-energy usage for home heating with limited opportunities to build upon economies of scale.

The purpose of this chapter is to guide planning decisions driven by this Master Plan—whether focused on land use, transportation, or economic development—so that they may better address these challenges. For many concerned about these challenges, the answer lies in planning for sustainability or for resilience, but even the best planning must be augmented and supported by a continued focus on energy efficiency and conservation on the part of both residents, local businesses, and municipal officials.

The anticipated benefits of realizing this vision include greater national security, a direct benefit to the many brave men and women in our armed services but also the broader community whether relatives, tax payers, or potential victims of terrorism arising from energy resource rich regions of the world. They also include direct cost reductions from greater efficiency (more insulation = lower oil bills, for example) and earnings from growth industries in the environmental and alternative energy industries. High quality, energy efficient housing not only reduces current occupants energy bills, but enhances the stability and growth of Durham's real estate market.

**Comment [B1]:** Discuss value to local businesses and industries? While the town cannot control these entities any more than it can control residents, there are nonetheless savings to be gained and potential power to be generated by these sectors.

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In addition to financial and security benefits of energy planning, many community members have expressed support for these steps for more expansive, even philosophical grounds, i.e., because they bolster the diversity and health of the natural environment, which in turn enriches and sustains the broader web of life so beautifully evident in the well-conserved and naturally scenic Durham environs. Not least, a lesser reliance on fossil fuels can provide significant health benefits when citizens enjoy an ever more walk-able and bike-able town.

Our vision for the future of Durham's energy usage is one in which the municipality, commercial property owners and homeowners realize cost savings while also reducing the Town's carbon emissions, thereby increasing the Town's resilience and sustainability relative to energy use. New construction will be built to higher energy-efficiency standards linked to current best construction and management practices. A large proportion of existing buildings, of which the aging housing stock is the major portion, will be retrofitted to minimize heat leaks through incentivized insulation programs. Planning bodies will study and develop recommendations around the density/compactness of existing neighborhoods and carefully sited and designed greenfield development near the core of the community and mixing of uses as a means to support the reduction of energy use for transportation to access daily needs (work, school, shopping, services, some recreation).

### BOLDNESS, BALANCE, AND DIALOGUE

Boldness of vision may be the best route to realizing change. Just as geothermal, solar, biomass, and district heating systems are making inroads in Durham's commercial and residential housing developments, so, too, will electric cars appear in greater numbers on Durham streets with attendant facilities for vehicle charging. Durham's reputation for sustainable building practices, the entrepreneurial frisson of its campus and business communities, and a significant improvement in the pedestrian and bicycle infrastructure throughout its downtown core will help guarantee, much as our excellent schools have for decades, that Durham remains a standout among New Hampshire towns.

While a significant majority of Durham's citizens have consistently voiced support elements of this vision, the gains we hope to make in the coming decades are not without costs and potential points of conflict with other community goals. The balance between the efficient flow of commuting traffic and pedestrian and bicycle access to the downtown is one example of an area where the town will need to balance competing needs. Financing efficiency measures with longer payback periods may bring greater costs to today's taxpayers and greater savings to tax payers of a decade or more later.

Stricter code standards and stringent environmental regulations can produce wealth over the long term, but in the short term can cause hardship to builders, reduce the stock of affordable housing, and proscribe potential jobs from certain industrial activities. These are just a few examples of the areas where town priorities may conflict and reasonable people will disagree. Throughout this chapter, we will be calling out those balancing points because only through vigorous discussion will Durham find the most balanced way of achieving the larger vision of this chapter.

In the face of these challenges, Durham has a number of strengths that make regional and national leadership on energy stewardship a realistic vision. First and foremost, the town has a tradition of forward thinking, organized action, and efficient governance that has resulted in gains in energy efficiency beyond most comparable municipalities. Durham has a tight knit and intimate business community that has shown a remarkable ability to respond creatively to new market conditions and, on its own, has made significant energy efficiency improvements to many properties and even within our single industrial facility.

**Comment [B2]:** Fusion?

**Comment [B3]:** A recent Maine law allows municipalities to support retrofits by building repayments for energy efficiency investments through tax bills (Town providing loans for retrofits). Not sure where NH state law stands on this type of strategy.

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Durham also hopes to translate its impressive intellectual and entrepreneurial capital due to the presence of the University of New Hampshire and its proximity to the Boston – Manchester technology into new economic opportunities in the growing energy efficiency and pollution control areas of the economy. Members of the community have expressed the hope that Durham might not only reduce its reliance on traditional energy resources but might in fact develop new ones that could conceivably become revenue sources for the town, perhaps through regional cooperation around solar, wind, and hydro power. While many university members serve on town committees and governmental bodies, Durham's ability to realize its energy goals will benefit from a closer collaboration between the leading climate and sustainability researchers on campus and officials, residents, and businesses.

### REGIONAL, STATE, AND LOCAL EFFORTS TO DATE

The mainstream scientific community holds a broad consensus that greenhouse gas emissions from the combustion of fossil fuels are a predominant contributor to well-documented global climate change trends. In acknowledgement of that view, residents across New Hampshire voted in 2007 to adopt the New Hampshire Climate Change Resolution.

In 2008, the State of New Hampshire responded by preparing the New Hampshire Climate Action Plan: A Plan for New Hampshire's Energy, Environmental and Economic Development Future<sup>1</sup> (the "Action Plan") to identify and mitigate these trends as observed throughout New Hampshire. The following year, a private/public partnership, the New Hampshire Energy and Climate Collaborative (NHECC), was formed to track and facilitate the implementation of the 67 recommendations of the Action Plan<sup>1</sup>.

As a long-term goal, the Action Plan proposes that New Hampshire reduce its greenhouse gas emissions to 80 percent of the 1990 levels by the year 2050, with a mid-term goal of a 20 percent reduction below 1990 levels by 2025. To accomplish these goals, the Action Plan outlined a wide range of recommendations to: maximize energy efficiency in buildings, develop renewable energy sources, support regional and national initiatives, and reduce total vehicle emissions through individual vehicle emission controls, optimization of land use patterns to minimize vehicle-miles driven, and expansion of public transportation options. A detailed list of the recommendations may be found in the Appendices.

In April 2007, the Durham Town Council formed the Durham Energy Committee to advise the Council on ways to reduce energy use, develop alternative energy sources, and increase the economic security and energy independence of the town. In August 2008, New Hampshire amended the statute requiring towns to have a Master Plan to allow the addition of a new chapter on energy, to include "an analysis of energy and fuel resources, needs, scarcities, costs, and problems affecting the municipality and a statement of policy on the conservation of energy." In mid-2008, the Durham Planning Board requested that the Committee draft a chapter of the Master Plan to steer the actions of the town with respect to energy.

### THE STARTING POINT: TOWN-WIDE AND MUNICIPAL ENERGY INVENTORIES

Durham, like most other towns, relies heavily on fossil fuels, the burning of which is a primary source of carbon dioxide, a significant greenhouse gas that traps heat in the atmosphere. The question asked by the Durham Energy Committee in 2008 was: How much energy does Durham actually use annually, what are the attendant emissions from that fuel consumption? The resulting survey was a first step in a broader, ongoing effort to benchmark efforts to reduce emissions over a longer period.

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To this end, the Energy Committee asked members of the UNH community to conduct a greenhouse inventory for the town, using the most recent (2007) data.<sup>i</sup> Total greenhouse gas emissions (from carbon dioxide, methane and nitrous oxide) were 74,300 metric tons of CO<sub>2</sub> equivalents. The majority of these emissions were due to carbon dioxide arising from the transportation and residential sectors. Energy consumption in the residential sector was primarily for heating, while transportation consisted primarily of personal vehicle fuels. Figure 1 shows the breakdown of emissions by sector, which clearly indicates the areas in which energy-efficiency efforts can lead to

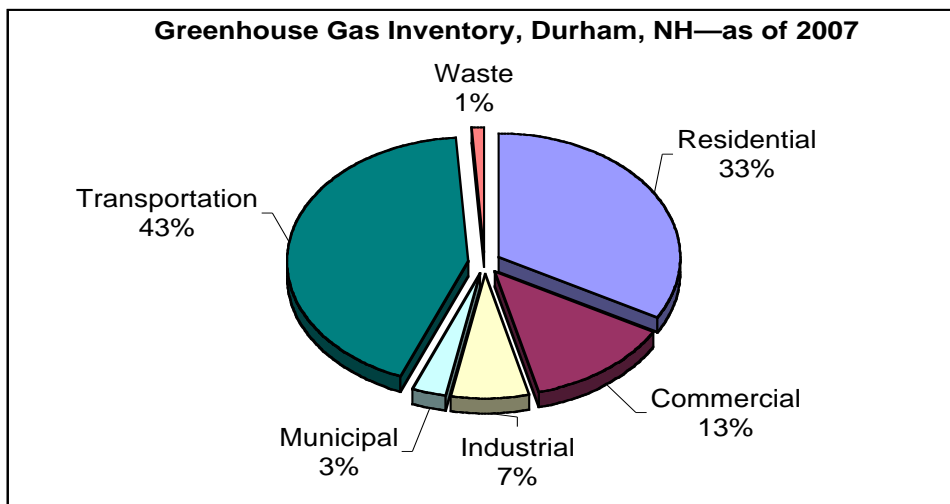


Figure 1: Greenhouse Gas Inventory, Durham, NH—as of 2007. Add better citation and short caption on methods.

the biggest greenhouse gas emission reductions. See the appendix for the original report and supporting data files.

In the half-decade since this survey was completed, the Energy Committee, UNH faculty and students, and the town departments have invested a considerable amount of time and energy benchmarking the municipal contribution to Durham's overall energy use. In the winter of 2010, the town completed a three-year profile of its energy use using the STOCC (Small Town Carbon Calculator)<sup>ii</sup> and eventually converting that data into a form comparable with other communities around the state through the New Hampshire Office of Energy Planning ETAP Program.<sup>iii</sup>

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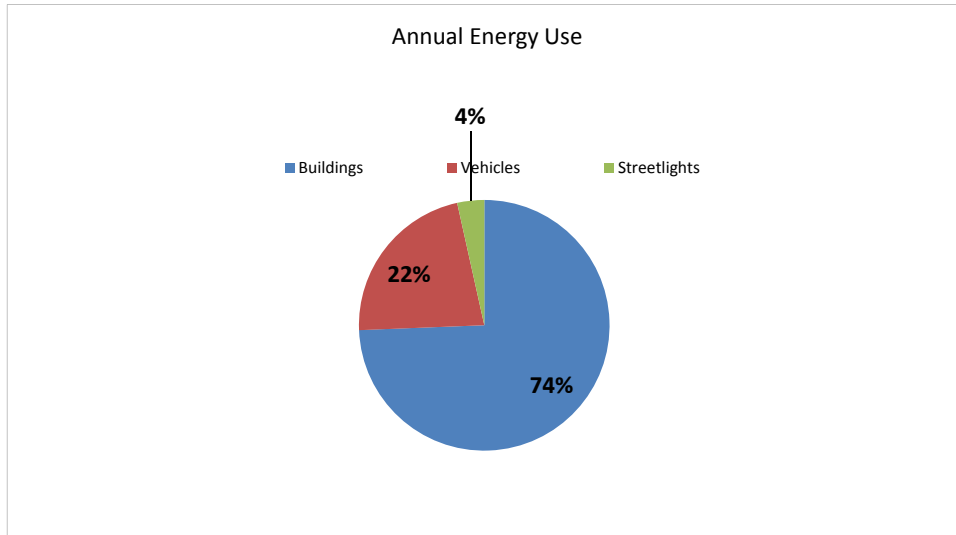


Figure 2: Small Town Carbon Calculator, Durham NH, 2010 Data

Among the broader insights afforded by these tools were the relatively high proportion of municipal energy use devoted to water treatment, the significance of town vehicle energy use, the relative inefficiency of some of the town's aging buildings, and the potential for savings through more active account management (including wholesale energy providers) as well as energy generation through joint ventures with the University of New Hampshire or municipal renewable energy production. While a useful beginning, the town wide metrics and municipal data will need to be maintained and improved over a longer period of time to provide useful benchmarks for progress toward realizing our energy vision.

**Comment [B4]:** Would be useful to ID key carbon generators in commercial and industrial sector.

### THE PILLARS: THREE ORGANIZING PRINCIPLES EMERGE FROM PUBLIC FORUM

In 2008 and 2009, the Energy Committee sponsored a series of public presentations and discussions on the question of how Durham could improve its economic vitality, ensure its energy stability, and reduce its environmental impact. (See appendix for the original flier announcing the forum). From these discussions emerged a set of three guiding principles ("pillars") that participants believed might help the town organize future discussions and actions, though each overlaps the other in important aspects.

- Pillar 1: Transportation
- Pillar 2: Architecture and Land Use
- Pillar 3: Alternative & Renewable Energy Resources; Efficiency & Conservation

Not surprisingly, the three pillars have guided the writing of this chapter of the master plan. In the three sections that follow, we will introduce each area of concern, and then list a series of issue best categorized under that

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heading. For each issue, we will list a specific goal, recommended actions, and metrics that we might collect to measure success in this area over time.

### PILLAR 1: TRANSPORTATION

Transportation accounts for a significant portion of Durham's annual residential and municipal energy use and cost. Through careful planning, Durham as a whole can reduce transportation costs and carbon emissions, and enhance the quality of individual residents' lives.

Since many of Durham's transportation patterns are rooted in its fundamental suburban, semi-rural setting and the nature of the regional economy, the master plan will focus on aspects of this complex issue amenable to change over time through municipal planning and public education.

The recommendations in this chapter, together with those of other master plan chapters, provide a roadmap to achieving a lower overall consumption of resources in the transportation section through increased proximity of residents to work/school/goods/services (see Pillar 2, Issue 1; greater residential and commercial compactness and mix of uses, and as detailed below strategies for encouraging alternative transportation options).

### ISSUES, GOALS, AND RECOMMENDATIONS

**ISSUE #1: VEHICLES ON OUR ROADS ARE RELATIVELY INEFFICIENT IN THEIR ENERGY USE, PRODUCE HIGH LEVELS OF EMISSIONS, AND RELY PRIMARILY ON FOSSIL FUELS.**

**Goal #1: Reduce use of energy-inefficient and high-emission vehicles in the municipal fleet**

#### Recommendations

- Require that new municipal vehicles are more fuel-efficient [standard?].
- Require that new municipal vehicles produce lower emissions such as the California Low Emission Vehicle (CALEV) Standards.
- Require that new municipal vehicles, where possible, use cleaner, alternative fuels such as electricity generated in total or part from renewable energy.

#### Implementation plan

- Measure the fuel consumption of municipal vehicles using the town's energy inventory tools.
- Require purchasing decisions for new municipal vehicles to complete an energy efficiency profile for the proposed vehicles documenting that the vehicles chosen are as efficient and clean as possible given the budgetary, use, and market limitations.
- Require departments to develop a plan to reduce fleet energy use by 30% in 10 years.

**Goal #2: Reduce use of energy-inefficient and high-emission vehicles among town residents and commuters**

#### Recommendations

**Comment [B5]:** What happened to recommendation to incentivize train travel?

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- Encourage the installation of charging stations and alternative fuel infrastructure to support more efficient and cleaner vehicles.
- Create parking and carpooling solutions such as Park-and-Ride locations at the Jackson Landing and Technology Drive sites for commuters.
- Encourage short-term car rental services (e.g. Zipcar) to reduce the overall number of cars maintained by the town and residents.
- Create disincentives for large vehicles and incentives for electric and alternative fuels (e.g. dedicated parking spaces, property tax discounts, registration fees).
- Institute a town-wide no-idling policy with a special focus on the schools, municipal offices, and the downtown.

### **Implementation plan**

- Establish a commuter webpage on the town website to coordinate free commuter parking, ride sharing, and other carpooling services.
- Track the usage of designated commuter and ride share parking lots and services on an annual basis.
- Install and publicize no-idling signs and programs at the schools, municipal offices, transfer station, and the downtown core.
- Establish transportation hubs and parking lots on the east and west sides of town that include "Park and Ride" options and ride share services.

### **ISSUE #2: REGIONAL PUBLIC TRANSIT IS INADEQUATE**

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**Goal #1: Engage in regional initiatives to improve access and convenience of public transit, particularly for commuters.**

### **Recommendations**

- Improve the comfort, safety, and convenience of existing bus stops throughout the downtown and surrounding neighborhoods.
- Improve awareness of public transportation options and schedules by locating a transportation information kiosk in the central business directing pedestrians to nearby train, bus, short-term rental, and ride share programs.
- Support and promote Amtrak train service in Durham in conjunction with the efforts of the Durham Economic Development Committee, to include on-line parking reservations at train station, covered bicycle parking, and coordination with local representatives to increase state support.
- Support and promote public transit for commuters (UNH and other) both within Durham and between Durham and popular regional destinations such as Dover, Portsmouth, Rochester, Manchester and Boston. Bus service to and from Concord and Manchester—an east/west transit corridor—is particularly needed.
- Identify towns, such as Rochester, where significant numbers of UNH community members live and work with UNH to expand commuter bus service between the towns.
- Expand train/bus service schedules: stimulate demand by increasing funding to provide convenience and infrastructure to enhance comfort (e.g., provide comfortable waiting and seating areas and protection from inclement weather).

### **Implementation plan**

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- Improve public awareness of transportation services and schedules through links on the town website.
- Work with Coast Bus to improve routes, stop locations, and provide sheltered, comfortable waiting places.
- Survey town residents every two years on commuting, home office, and public transportation usage to measure progress over time.
- Monitor commuter parking lot usage over time and evaluate trends in usage.
- Collaborate with Amtrak to review ridership statistics to and from Durham and address opportunities for improvement of service, accessibility, and public awareness.

**Comment [B6]:** What about collaboration with state agencies?

### ISSUE #3: BICYCLE USAGE AND PEDESTRIAN ACTIVITY IN DURHAM ARE BELOW THAT OF LEADING ENERGY EFFICIENT MUNICIPALITIES IN OUR CLIMATE ZONE

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#### **Goal #1: Support safer, more convenient bicycling throughout Durham.**

##### **Recommendations**

- Expansion of dedicated bicycle lanes and road striping throughout Durham roadways.
- Development of comprehensive networks of bicycle paths connecting neighborhoods and nearby towns, including connections to existing and planned regional biking networks.
- Establish a bicycle corridor to connect with other nearby towns determined to be particularly desirable destinations for Durham residents.
- Increase signage and education to share the road (e.g. Maine recently adopted a statute requiring motorized vehicles to keep a distance of 4' from bicyclists when there are no striped bike lanes).
- Improve bicycle convenience and security by changing off-street parking ordinance to require siting of bike racks.
- Work with the schools to encourage bicycling by students and employees, ensure adequate and secure bike storage at all school locations, and to ensure safe routes to school through traffic planning.
- Provide and maintain bike racks for public use in a prominent location at every major municipal property sheltered from the elements whenever possible.
- Encourage development of bike share/rental program akin to those in Boston, Denver, Miami, Minneapolis, New York City, Portland (OR), Washington D.C./Arlington County (VAA), San Antonio, Montreal, and Toronto.

##### **Implementation plan**

- Conduct a town-wide street assessment relative to non-vehicular safety every two years to measure progress and identify opportunities for improvement.
- Conduct a survey or study on bicycle use every five years to gauge ridership levels and measure change over time.
- Survey the Central Business District and residential neighborhoods for possible new walking and biking paths.
- Publicize existing alternative transportation connectors with signage, plowing, website information, and/or a printed brochure or map to improve citizen awareness and use of these amenities.
- Continue to develop a dialogue with UNH to participate in community planning that encourages safe forms of alternative means of transportation for the student population.

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- Partner with school administrators or student groups to survey the bicycle infrastructure at all school locations, to review the safety of routes to school, and conduct outreach encouraging bicycle use.
- Seek grant funding such as the Safe Routes To School program to fund improvements.

**Goal #2: Improve pedestrian safety and access in downtown Durham and surrounding neighborhoods.**

### **Recommendations**

- Widen and improve accessibility of sidewalks.
- Improve safe routes to school to encourage grade school students to walk to school and reduce driving in individual family cars.
- Recondition pavement, improve lighting, and plowing of downtown pedestrian alleys and cut through pathways to improve appearance of areas and efficiency of pedestrian travel.
- Expand Durham's network of intra-neighborhood pedestrian pathways (e.g. Grange path, Faculty Neighborhood Mill Plaza path) to reduce pedestrian travel distances.
- Encourage increased residential density of neighborhoods surrounding downtown and near schools (see Pillar #2)
- Establish an alternative traffic pattern both to increase walkability within the downtown areas and to alleviate traffic congestion.

### **Implementation plan**

- Survey pedestrian usage of major sidewalks, neighborhood paths, and open spaces every two years to measure progress and identify opportunities for improvement.
- Collaborate with student and administrative groups within the schools to raise the visibility and importance (for health and energy reasons) of walking to school, publicizing safe routes, and surveying students on areas in need of improvement.
- Identify maintenance issues with existing pathways including improved signage, maintenance, snow clearing, and overall appearance and condition.
- Survey neighborhoods and areas of the downtown with inadequate pedestrian access and create additional landscaped pathways for those areas.
- Expand the municipal website information on pathways and trails in the town

**Comment [B7]:** For those neighborhoods that are more than a ½ mile walk of DT, consider allowing some mixing of neighborhood business uses - ie, a convenience store?

## **PILLAR 2: ARCHITECTURE AND LAND USE**

Over the past few decades, Durham has emerged as a leader in municipal best practices for land use, conservation, and energy efficient zoning and planning. Since transportation is such a large part of Durham's overall energy consumption, the primary way that Durham can reduce that usage is through planning and zoning for new housing and renovations and expansion of existing neighborhoods. We can significantly reduce the number of miles travelled in private vehicles through close attention to siting issues, density of settlement, and access to pedestrian and bicycle routes to the downtown core as well as mass transit. Conservation and open space concerns will have to be balanced with the improved energy and resource efficiency of smaller, denser semi-urban development.

Beyond the location and siting of dwellings, Durham must continue its tradition of encouraging the highest level of building code enforcement and energy efficiency best practices in architecture and construction. In New England,

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the largest portion of all energy consumption goes to heat homes and businesses. Much of this heat comes from fossil fuels, including relatively inefficient and polluting heating oil.

As the town courts new businesses, reviews land use plans, approves building permits and revises zoning and building codes, it should seek municipal, residential and commercial development and redevelopment that maximizes energy efficiency, contributes less environmental pollution, and reduces need for motorized vehicles for day-to-day activities (getting to/from work, school, shopping, services, recreation).

### ISSUES, GOALS, AND RECOMMENDATIONS

#### ISSUE #1: DISTANCES BETWEEN NEIGHBORHOODS AND THE CENTER OF TOWN ENCOURAGE WASTEFUL VEHICLE USE.<sup>iv</sup>

**Goal #1: Reduce the distance between new developments and the town core so as to minimize the need for motorized transport and thereby lower the impact on the town's energy footprint.**

#### Recommendations:

- Planning and zoning regulations should reflect the direct impacts of developments on road maintenance expense, infrastructure, and other municipal expenses.
- Encourage mixed-use development (business and residential).
- Central business district redevelopment should be designed with regard for an interconnected network of sidewalks and bicycle paths.
- Locate public buildings with regard to access to public transportation, bicycle paths, and walking access to basic services.

**Comment [B8]:** Expand to include other districts in DT (PO, CH, C). I'd use the phrase "Downtown districts" should be designed...

#### Implementation plan

- Amend zoning ordinance to require new subdivisions to include dedicated bike lanes and pedestrian walkways.
- Consider a road impact fee associated with new development.
- Amend zoning to allow compact, residential neighborhoods near downtown.
- Retrofit existing neighborhoods to provide bike lanes/walkways where needed/appropriate?

**Comment [B9]:** Issue of allowing a 1-2 convenience store for neighborhoods beyond ½ mile from DT.

What happened to recommendation re tax break/density bonus?

**Goal #2: Promote higher density in conjunction with conservation of open space, shared infrastructure (roads, driveways, septic systems, district heating) Raise distinction between conservation subdivisions and traditional neighborhood design (TND) subdivisions and value of TNDs near downtown.**

**Comment [B10]:** Should you include a description and/or footnote describing the differences between these 2 forms of residential subdivisions?

#### Recommendations

- Encourage building common utilities such as district heating (one heating plant that serves many houses or buildings) or common PV systems. Need to research zoning ordinance. Comment on KG46 comment above – research zoning ordinance – to what end? Research what aspects?
- Revise zoning to encourage the building of smaller houses. This includes reassessing requirements for the size of accessory apartments relative to the primary house. (Larger buildings are inefficient with regard to energy use.)

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### Implementation plan

- Provide a tax break to take into account a "density bonus", which would reward placement of houses in plots below a certain size, adjacent to other houses complying with similar area restrictions.

ISSUE #2: MANY MUNICIPAL PHYSICAL ASSETS, BOTH BUILDINGS AND EQUIPMENT, ARE AGING AND INEFFICIENT IN TERMS OF ENERGY USE.

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**Goal #1: Make all municipal assets energy-efficient both to reduce costs of municipal operations and to reduce carbon intensity of operations: 30% reduction over 2007 in total energy use by 2020.**

### Recommendations

- Measure and report annual energy usage (heating fuel, electricity) in each Town Report detailed by asset (individual buildings and vehicles). Include historical trends. Is this for municipal facilities/functions or all sectors laid out in the pie chart?
- Conduct detailed energy audits on all buildings and follow recommendations to insulate, air seal. This is a big task – I encourage you to set priorities/time frames.
- Create an energy fund from savings in energy costs as a result of these initiatives. Fund will be used for new energy efficiency and renewable energy creation initiatives.
- Any new municipal building should be built to high energy and water efficiency construction and operational standards. Again, the first issue should be location. (Water use and wastewater treatment are both major electricity consumers in the town and thus water conservation = energy conservation.) This point should be made in the inventory/data and analysis part of this chapter.
- Explore the benefits of green roofs for energy savings and improved storm water quality.

### Implementation plan

- Prioritize energy inefficient building using the energy audit and make a action plan for the Town of Durham
- Use the benchmarking to make informed decisions
- Use the Capital Improvements Plan to identify energy efficient opportunities
- Team up with UNH for a energy challenge myenergy.net
- Pursue grant opportunities, rebate programs, and financing mechanisms for replacement and retrofitting of inefficient equipment and structures
- Consider combining some municipal functions under one roof (e.g., town offices, library, fire or police stations, youth center) to reduce material and energy costs.

ISSUE #2: EXISTING RESIDENTIAL HOUSING STOCK IS AGING AND MANY DURHAM HOMES EXPERIENCE UNNECESSARY HEAT LOSS DUE TO POOR INSULATION AND LEAKY CONSTRUCTION

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**Goal #1: Reduce energy used for heating and cooling of residential homes.**

### Recommendations

**Comment [B11]:** There should be some info in the inventory about potential benefits of green roofs. I sent highlighted info from one of my students report on green roofs. You could probably cut and paste and/or paraphrase the highlighted into and include the references in the bibliography in your Appendices and/or sourcing of the description of the benefits of green roofs.

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- Work with state legislators to initiate and promote municipal and private funding mechanisms for energy efficiency programs as well as other types of state energy efficiency incentive or grants programs.
- Support efforts to increase the energy efficiency of the governing building code at the town level and advocate for similar standards at the state level.
- Increase the number of homes with ~~current energy audits and weatherization~~ through incentive programs, workshops, and website materials.
- Publicize and educate residents on the importance of weatherization to save both money and energy.

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### Implementation plan

- Conduct a survey of Durham home energy usage, heating technology, and attitudes toward home weatherization.
- Promote case studies of efficient Durham homes through websites like the Green Homes Tourist and public events such as open houses.
- Establish model homes whose energy efficiency, cost savings, and alternative fuel use can provide regionally relevant models for retrofits.
- Offer incentives and prizes at educational events for free energy audits in cooperation with local energy audit service companies.
- Work with utilities and fuel companies to collect usage information for the town and track change over time.
- Publish recommendations on various convenient fuel sources, heating technologies, and building retrofit techniques appropriate for our ~~climate~~.

Comment [B12]: Work with Town and appropriate private and nonprofit organizations to develop a low interest weatherization loan program.

ISSUE #3: NEW CONSTRUCTION FEATURES AND METHODS AFFECT A BUILDING'S ENERGY CONSUMPTION. NET-ZERO ENERGY HOMES ARE NOW BEING BUILT IN CLIMATES SIMILAR TO DURHAM'S REQUIRING VERY LITTLE ENERGY TO HEAT.

Goal #1: Encourage energy-efficient building practices for both new construction and renovation so that they meet the highest reasonable levels of energy efficiency

### Recommendations

- Amend the building code to encourage / allow proven innovative energy-efficient technologies, methods and materials, subject to approval by the Building Code Inspector
- Allow zero setbacks and party walls /DEFINE THIS
- Incentivize small houses, ~~dense compact~~ neighborhood construction, and efficient buildings through zoning EXPLAIN AND GIVE EXAMPLE
- Require new construction to meet current nationally recognized energy-efficient standards.
- Prohibit homeowner association rules or covenants that forbid energy-efficient measures, such as clotheslines, solar panels, windmills, etc.
- Require landscaping that minimizes energy requirements.
- Encourage solar thermal heating/domestic hot water systems, including for hot tubs and pools.

Comment [B13]: This phrase is less emotionally loaded and reflect a more reasonable image of density for smaller northern New England communities.

### Implementation plan

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- Amend zoning ordinance to encourage use of natural / passive cooling in homes, beginning with siting of buildings standards and landscaping guidelines to reduce energy use.
- Durham should conduct an inventory of high efficiency homes through building permits and self reporting and track trends in those numbers over time.
- Building permit and planning board reviews should be accompanied by on-line surveys as a data collection tool for building practices.

**Comment [B14]:** Do you want to set a quantitative goal and time frame for this strategy?

**Goal #2: Develop regulatory measures or voluntary incentives to ensure energy efficiency for new and existing private (residential) and municipal construction.**

**Comment [B15]:** Again, why aren't you including commercial/industrial sector? If you are afraid it will discourage C/I development, there are cost savings to business that won't be lost on them.

Also, could establish a low interest loan fund for commercial weatherization/retrofits.

### Recommendations

- The Building and Code Enforcement Officer shall attend 16 hours of continuing education per year on energy codes and shall provide evidence to the Durham Energy Committee or Town Council of his/her International Code Council Energy Certification as a residential energy inspector
- The town should also consider providing an energy tax or surcharge to discourage construction and use of excessively large or wasteful structures
- Provide tax incentives for net-zero or ultra-high efficiency building techniques

**Comment [B16]:** Do you want to make a specific recommendation - ie, drop "consider" - alternative language might be "The Town should investigate and adopt an energy tax or..."

### Implementation plan

- Provide an energy efficiency checklist to building permit and planning board variance review applicants to encourage energy efficient design and siting.
- Review the national and regional building code standards and ensure that Durham has adopted the highest standard of commonly accepted codes for energy efficiency in our climate zone.

**ISSUE #6: WINTER PRODUCE INCURS TRANSPORTATION COSTS AND OFTEN PETROLEUM-BASED FERTILIZERS AND PESTICIDES, WHILE DWINDLING ACREAGE OF PRIME FARMLAND IN THE REGION REDUCES THE POTENTIAL FOR LOCALLY GROWN PRODUCE DURING THE GROWING SEASON.**

**Goal #1: Reduce the Town's reliance on a food supply that in turn relies on—and therefore is vulnerable to—high use of energy resources through transportation, refrigeration, and pesticide dependence.**

### Recommendations:

- Plan land use so as to keep agricultural lands available for food production. In other words, discourage residential development in rural areas?
- Consider the development of an agricultural overlay for the town zoning ordinance. Do you want to make a more direct recommendation? Should? Shall?
- Work with other towns and the State to develop support and incentives for small-scale local food production.
- Support local food production by facilitating the establishment of community gardens. Common land in conservation subdivisions should be set aside for neighborhood garden plots and recreation areas.

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- Support/encourage “buy local” options through the town’s farmers market, CSAs, other emerging techniques.

### Implementation plan

- Advise the Town Council on the energy resource benefits of the establishment of an Agricultural Commission or Committee

### PILLAR 3: ALTERNATIVE AND RENEWABLE ENERGY RESOURCES

Improvements to Durham’s transportation and land use/building construction practices are essential to reducing the town’s *demand* for energy. Corresponding attention to and investment in alternative energy sources are equally essential to secure for the long term its *supply* of energy. The balance between reduction in demand and new forms of renewable or sustainable supply will have a profound effect on the affordability, environmental sustainability, and security of Durham over the coming century. Alternative energy sources include geothermal, passive and active solar, wind, hydro, and fuel cells. Renewable or sustainable energy sources include biomass fuels such as conventional and new wood products and refuse as well as district heating systems.

The town of Durham must take action on a municipal level to reduce the town’s consumption of fossil fuels, increase its reliance on alternative and renewable energy sources, and thereby stabilize energy prices and hedge against increasing fuel prices. Such measures will not only reduce taxes in the short term, but will also make Durham a more affordable and secure place to live over the long term. More broadly, the town can encourage residential use of alternative energy through educational activities, municipal finance activities, and tax incentives.

**ISSUE #1: PETROLEUM PRICES HAVE BECOME INCREASINGLY VOLATILE AND ARE LIKELY TO RISE OVER THE LONG TERM DUE TO PEAK OIL, BUT ALTERNATIVE ENERGY HAS HIGH UPFRONT COSTS**

**Goal #1: Reduce the municipal vulnerability to energy price volatility and environmental impact.**

### Recommendations

- Source a growing percentage of the town’s energy demand from renewable energy sources with fixed payback and pricing.
- Contract with innovative suppliers of energy for longer periods of time (rate lock in)
- Seek energy suppliers with renewable energy sources to further reduce the town’s fossil fuel dependency.

### Implementation plan

- Conduct a review of all energy suppliers for their renewable energy portfolio and price stability offerings.
- Enter into a power purchase agreement allowing the town to produce some of its own energy through renewable sources at little additional cost to the tax payers
- Seek grant and rebate funding for municipal renewable energy projects
- Develop municipal ‘clean energy districts’ financing mechanisms for residents.
- Participate in the development of regional energy cooperatives

**Comment [B17]:** Somewhere in inventory immediate before this section, you should probably acknowledge the relative high cost of alternative energy generation, but also acknowledge the as the cost of conventional fuels continue to rise (basic supply/demand issue as we’ve hit the peak oil point and are now moving to the downside of the curve on supply), the relative cost of alternative approaches will become more cost competitive.

Also in the face of state/federal tax incentives and grants, home/business owners may find it worth their while to make the investments (could also demonstrate life cycle costs – how long to pay off the investment) as a PR move to encourage private investment.

**Comment [B18]:** Do you want to quantify this recommendation and time frame?

**Comment [B19]:** Work with home heating fuel companies, state, and nonprofit interests to change company’s exclusive focus on oil and/or gas to a mix of options (wood fuel pellets, geothermal, solar installations...) to shift focus to home heating systems – a broader focus.

In the past couple of months, there two separate but similar initiatives have started to make this shift. I sent blurbs on these projects to Jim. If he didn’t forward them to you, please, let me know and I’ll send them onto you..

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### ISSUE #2: THE BURNING OF FOSSIL FUELS IS DETRIMENTAL TO THE ENVIRONMENT

**Goal #2: Reduce Durham's municipal, commercial, and residential overall impact on the environment.**

#### Recommendations

- Develop solar energy for electricity and hot water: PV systems and solar thermal hot water and/or radiant heating; encourage the use of these in houses and buildings [Fil 4/7/10] What does this mean? (DEVELOP)
- Encourage natural cooling during summer months (such as window shading, use of attic fans, use of trees as natural shade, and/or use of artificial shade).
- Consider ways to attract green fuel and recharging businesses to gasoline alley, including traditional fuel companies who might be encouraged to see themselves as providers of heating fuels more broadly.
- Provide municipal financing for the upfront investment of renewable energy systems through PACE -like funding mechanisms as they become available.
- Encourage outdoor clothes drying, reduced usage of municipal water (whose purification requires a great deal of energy), hand powered tools such as lawn mowers.

#### Implementation plan

- Conduct an inventory of renewable energy systems in the town and track change over time in two-year increments.
- Sponsor open houses, newsletter mentions, and website profiles of existing and new renewable energy installations to promote public awareness.
- Offer consultations and educational resources on renewable energy through the Energy Committee and other local resources.
- Develop an energy conservation plan similar to the water conservation plan [developed by the Town Engineer].
- Implement Regional Greenhouse Gas Initiatives and standards.

### AN INTEGRATED EDUCATION, OUTREACH, AND WORKFORCE TRAINING PROGRAM

In order to achieve these goals during the period covered by this plan, the Town of Durham, and in particular its Energy Committee, is committed to an integrated education, outreach, and workforce-training program including but not limited to these components.

1. Develop an Overarching Outreach and Education Plan
2. Include Energy Efficiency and Conservation in School Curriculum
3. Increase Energy Efficiency through Building Management Education Programs
4. Reduce Residential Energy Demand through Education and Outreach
5. Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program
6. Create an Energy Efficiency and Sustainable Energy Systems Web Portal
7. Support Regional and National Actions to Reduce Greenhouse Gas Emissions

**Comment [B20]:** Any recommendations around wind? A number of communities have found small wind generators to be quite controversial and have developed minimum siting and safety standards both to protect the generator and neighbors

**Comment [B21]:** And commercial/industrial.

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Moreover, we recommend that the town establish an Energy Commission with statutory authority to ensure committee slots do not fall vacant and to provide the committee with a mechanism for raising and expending funds in support of energy efficiency goals.

### MEASUREMENTS AND BENCHMARKS

Within each of the three pillars, we emphasized the measurements and benchmarks to be collected by the Town of Durham and the Energy Committee. The ten-year program of benchmarks can be summarized as follows to provide an overview of the data available to town planners in the coming decades:

1. Energy audit and inventories for municipal properties
2. Town wide and regional statistical samples
3. Utility township aggregate data and comparative studies
4. Surveys of Durham households for energy efficiency efforts (2 year intervals)
5. Encouragement of My Energy Planner and other existing surveys and planning/education tools
6. Building Permit/Planning Board/Registration surveys and checklists
7. Contests, incentives, and events tied to survey completion

### POINTERS TO OTHER SECTIONS

Energy cuts through all of the other chapters of the master plan. The considerations raised here will be echoed through this document, but see especially ....

### APPENDICES

The following appendices are available to provide valuable background information that helped to generate the conclusions and perspectives of this chapter.

1. 2007 Energy Study Documents
2. STOCC Carbon Calculator
3. Perigrine Energy Reports
4. 2008 Public Meeting Flyer

<sup>i</sup> The source for the UNH study, its participating scholars, etc. should be listed in this note.

<sup>ii</sup> The STOCC calculator was developed to serve the needs of small towns addressing the growing costs of municipal energy use and emissions. For more information, see the Clean Air Cool Planet website at [http://www.cleanair-coolplanet.org/for\\_communities/stocc.php](http://www.cleanair-coolplanet.org/for_communities/stocc.php).

<sup>iii</sup> For more information on the New Hampshire Office of Energy Planning ETAP Program, see <http://www.etapnhc.org/>.

<sup>iv</sup> "The Housing + Transportation (A+T) Affordability Index is a new and more comprehensive way of thinking about the cost of housing and true affordability by exploring the impact that transportation costs associated with location

**Comment [B22]:** Another strategy is to establish measurable goals and time frames to track progress.

**Comment [B23]:** Great rewrite!

Here are a few more miscellaneous comments:

- what happened to recommendation re shared parking in DT?
- what happened to recommendation for a parking authority in DT?
- what about suggestion to encourage increased residential density/compact neighborhoods around existing schools?
- I recommend you describe district heating system at UNH in inventory and discuss opportunities for tying in with development in rest of Durham (where feasible).
- I recommend you add a section on UNH's engagement/research on energy and discuss both economic development potential and saving for Durham residents/business owners of having innovative/commercialization efforts in community
- still thinks it's valuable to review MP survey to see if there are any themes that are resonant/conflicting in this chapter - if so, they should be identified

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have on a household's economic bottom line. The H+T Index is an innovative tool that measures the true cost affordability of housing. The traditional measure of affordability used by planners, lenders, and most consumers recommends that housing should be less than 30% of income. The H+T Index, in contrast, takes into account not just the cost of housing, but the costs of housing and transportation. The Index has received much attention from policy makers for its benefits to planners and TOD advocates and is already being used for additional research." [Source: "H+TSM Affordability Index," Center for Neighborhood Technology, Chicago, Illinois, 2010.]