Town of Nantucket

DRAFT

A Climate Action Plan for Nantucket Island

A roadmap to achieving targeted reductions by 2020.

7/15/2010

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This document was prepared by Sustainable Nantucket.

LETTER FROM THE NANTUCKET BOARD OF SELECTMEN

Open letter to the community of Nantucket:

We, the Nantucket Board of Selectmen, have made the commitment to make climate action and carbon emissions reduction a priority for our Town government and community. In March of 2008, we voted to join the International Council of Local Environmental Initiatives (ICLEI) and participate in their Cities for Climate Protection (CCP) Campaign. On March 25, 2009, Nantucket achieved the first two milestones of the Climate Protection Campaign process. We accepted the Greenhouse Gas Emissions Inventory report completed by Sustainable Nantucket on behalf of the Town, and approved the suggested targets for reduction of greenhouse gas emissions detailed in the report (See Appendix for full copy of report with approved targets).

The third milestone of the CCP Campaign is the development and approval of a Climate Action Plan (CAP or Plan) for the Town of Nantucket. A CAP is a collection of initiatives designed to reach the target reductions. These initiatives will address both primary and secondary sources of carbon emissions. Through adoption of this Plan, the Town articulates possible strategies designed to increase energy-efficiency in Town buildings, improve departmental practices, encourage the use of cleaner fuels, and invest in renewable energy within the municipal and community infrastructure. The Town will develop community policies, as well as educational and incentive programs in collaboration with schools and local non-profits, designed to encourage participation in the CAP by year-round and seasonal families, visitors and guests.

There are many reasons to draft a CAP, not the least of which are the potential economic and environmental benefits (cleaner air, cleaner water, reduced traffic and pollution) derived from energy conservation and reduced dependency on fossil fuels. Nantucket has strong, practical motivations for joining the CCP Campaign and making a definitive commitment to reducing fossil-fuel use and carbon emissions. In addition to reducing high-energy costs, our unique geographical situation makes us particularly vulnerable to the potential effects of climate change – advanced flooding and erosion should the sea-level rise as predicted, and devastating storm damage if the wind and water currents are altered.

Adoption of the CAP identifies and supports utilization of the significant renewable energy resources (wind-power --land-based and sea-based-- and tidal-power) that are available all around us to possibly achieve energy independence, as referenced in Nantucket's Master Plan, approved by the Planning Board and adopted by Town Meeting in April of 2008. Adoption of the CAP and implementation of certain specific actions will fulfill criteria set by the Massachusetts Green Communities Act, thereby making the Town of Nantucket eligible to receive state funding toward renewable energy development. In addition, as a resort destination for many influential seasonal residents and visitors, Nantucket's CAP can serve as an inspiration – the foundation of a

model of sustainability – which other communities across the nation may wish to copy. Successful implementation of the CAP initiatives and achieving target reductions could make us a destination for visitors beyond our traditional summer season and lead to economic benefits for our community in the form of eco-tourism and job creation.

As the elected leaders of the community of Nantucket, we strongly feel that is also incumbent upon us to envision, plan for, and safeguard the future of the Island, in as strategic and forward-thinking a manner as possible. Our acceptance of, and support for the CAP, actively demonstrates our commitment to reaching the benchmarks stated herein and we urge all residents to work collectively with us to reach the Plan's goals.

Sincerely,

_____
Patricia Roggeveen, Chairperson

_____
John "Rick" Atherton

_____
Brian Chadwick

_____
Michael Kopko

_____
Whiting Willauer

THE INTERNATIONAL COUNCIL OF LOCAL ENVIRONMENTAL INITIATIVES (ICLEI)

ICLEI is an international member association of local governments who are dedicated to climate protection and sustainable development. The council was established in 1990 when 200 local governments from 43 different countries came together at the United Nations in New York. In 1995 the USA branch was created, which now includes as members, over 500 towns and cities that are working towards greenhouse gas reductions and sustainable development.

In 1993, ICLEI began the Cities for Climate Protection Campaign (CCP) to assist local governments that have committed to addressing the issues surrounding increased greenhouse gas emissions and the resulting global climate change. The CCP is a global campaign aimed at slowing the earth's warming trend by enlisting cities to prepare and enact plans to reduce energy consumption and associated greenhouse gases.

Nantucket Joins ICLEI

In March of 2008, at the request of a local non-profit, Sustainable Nantucket, Nantucket's Board of Selectmen unanimously voted in favor of joining ICLEI and the Cities for Climate Protection (CCP) Campaign. At this time, the Board accepted the offer from Sustainable Nantucket, to assist in the CCP process in collaboration with the Nantucket Energy Study Committee.

The Cities for Climate Protection Campaign (CCP) Milestone Process

The CCP involves a five-milestone process to achieve greenhouse gas emissions reductions. The five milestones are as follows:

Milestone One: Conduct a baseline emissions inventory for the entire community and municipal operations. From the baseline data, emissions growth or decline is forecasted assuming no actions are taken to address greenhouse gas emissions. The primary emission sources examined in the Milestone One Inventory are:

- *Transportation* - Emissions from personal and commercial vehicles
- *Energy Use* - Energy for residential, commercial, and municipal facilities
- *Solid Waste* - Methane and Carbon Dioxide (CO_2) contribution of waste disposal operations

Milestone Two: Set an emissions reduction target. Many local and international targets have been set at twenty percent of the base year emissions level and use their projection year as the target year for obtaining these emissions reductions.

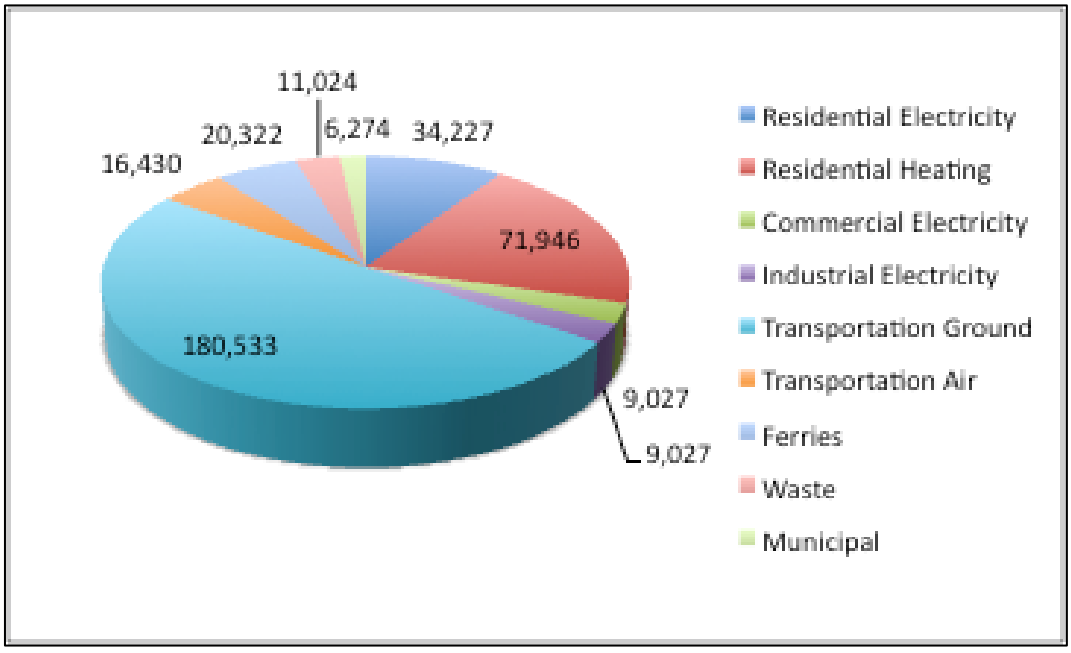
Milestone Three: Develop a local action plan or a collection of initiatives to reach the target reductions. These initiatives will include finding efficiency and technological improvements available to the municipality.

Milestone Four: Implement actions. This milestone involves municipal government to formally adopt emission reduction initiatives. Further, various municipal departments may be called upon to coordinate and implement the adopted initiatives.

Milestone Five: Monitor emission reductions. Monitoring and verification of progress on the implementation of actions to reduce emissions is an ongoing step that begins once measures are implemented. ICLEI's software tool assists in the quantification of emissions reductions and allows for convenient reporting of results.

Nantucket Emissions Inventory

On March 25, 2009, Nantucket achieved the first two milestones of the CCP Campaign process. The Board of Selectmen accepted the Greenhouse Gas Emissions Inventory report completed by Sustainable Nantucket on behalf of the Town, and approved the suggested targets of greenhouse gas emissions reduction detailed in the report. A breakdown of total emissions is shown on the chart below. For detailed information on the inventory and targets, please see Appendix E, on page 37.



Municipal + Community Emissions Inventory in metric tons of carbon dioxide equivalent in 2007. See source data in Appendix E and F.

THE CLIMATE ACTION PLAN: VISION, STRATEGIES & GOALS

Goal: The Town has adopted the goal of reducing total Nantucket Island greenhouse gas emissions by 10% below 2000 levels by 2020.[1]

The purpose of this Climate Action Plan (CAP) is to identify actions that both the municipality and the Island's private community can take in order to reduce Nantucket's total greenhouse gas emissions to 10% below 2000 levels by 2020. We estimate that emissions have increased 10% since 2000, and project that in the absence of any mitigation measures, emissions will increase 3% per year through 2020[2], therefore achieving the 2020 goal will require reductions of 20% from the 2007 baseline across all major categories.

As the following content will demonstrate, achieving Nantucket's reduction targets will require extensive participation and commitments by the community, especially private citizens, and the Town. The plan is designed to give stakeholders a comprehensive view of the scope and scale of actions that will be necessary in achieving the goal. The initiatives listed are a broad menu of possible steps and the list is illustrative and flexible. In order to reach the targets however, bold steps will need to be taken, possibly involving changes in current behavior patterns and will require sacrifices at both the individual and collective community level.

Strategy Overview

The strategies in this CAP are grouped into the following major energy use / emissions source categories:

- Transportation
- Heating
- Electricity
- Waste Management
- Green Communities Requirements

Each category contains a summary of its impacts relative to other sources followed by select "Strategy Spotlights" which detail actions that can be taken to reduce emissions, and in some cases, consideration of the cost and benefits associated with a specific reduction strategy. Some programs are either existing measures or are currently in the development stages, others are totally new initiatives. Many of the new initiatives follow the example of other local government emission reduction efforts.

[1] For a further discussion of the reduction goals see the Inventory in the Appendix

[2] Nantucket's residential population increased 10% between 2000 – 2007, forward looking assumptions are based on the US Energy Information Administration's projection of 3% per year emissions growth between 2008 – 2035.

Nantucket's 2020 goal will not be feasible without significant reductions in the largest emission sources, namely private vehicles and residential heating and cooling. Together, these account for 79% off all on-island emissions. It will be very difficult to achieve the overall goal without a significant reduction in fuel usage for vehicles and significant improvements in heating and electricity use in buildings.

In an effort to facilitate Nantucket's application for the State of Massachusetts Green Communities Grant Program, the last section of the Plan highlights the five requirements for qualification, which include a 20% reduction in municipal energy use. Where those requirements are featured in the body of the Plan, they are noted as a Green Communities Requirements with the letters "**GCR**" next to the strategy. If Nantucket successfully meets the five requirements for the Green Communities program, the town will be eligible to receive a portion of the approximately $7M in annual grant awards to fund energy efficiency and conservation programs in the state.

Appendices A – D list each strategy along with its anticipated cost and impact on a relative basis. Appendices E and F provide emissions inventory summary and details respectively. All actions with high or medium impact should be thoroughly investigated.

The Town's Role

The town can help facilitate the rapid development and deployment of reduction tactics by adopting the following strategies:

- ✓ Use Town leadership to inspire community action
- ✓ Build on existing efforts in the community
- ✓ Create a position, contract for services, or department assigned to:
  - o Monitor progress of emission reduction programs and report the results
  - o Coordinate implementation and funding
  - o Manage energy contracts for the Town
  - o Network with other communities and organizations who are participating in CCP Campaigns in order to learn from their experience and programs
  - o Engage the community by developing education campaigns
- ✓ Maintaining openness to innovation and policy-making
- ✓ Evaluate and implement emissions reduction strategies under municipal control (noted herein with a **(M)** in the subject heading).[3]

[3] Strategies are noted with an "**M**" if the Town can either implement the strategy for its municipal operations OR institute policy towards the desired goal.

It is important to keep in mind that direct municipal emissions are less than 4% of the total. Drastic reductions by the municipality will have an insignificant effect on reaching the established goal.

The Community's Role

Over 95% of the Island's total emissions are generated from private, commercial and industrial gasoline, fuel oil and electricity consumption. Town leadership can build infrastructure, set policy and live by example, but members of the community will need to be personally accountable for the conservation and efficiency actions suggested in the CAP in order to achieve the Island's emissions reduction goal.

In many cases, the greatest challenge to action is inertia and lack of information. We hope that this plan will be a valuable step along the path to empowering members of our community to identify ways to reap measurable cost savings from reductions in gasoline, fuel oil, or electricity usage through efficiency, conservation and new technologies. We encourage members of the community to get involved in the evolution of this plan and to follow the Town's lead in taking action.

TRANSPORTATION: GROUND, AIR, AND WATER

Transportation related activities (ground, air and water) account for 60% of the island's total emissions. It will be nearly impossible to accomplish the 2020 reduction goal without substantial reduction in fuel consumption for transportation, and specifically in ground transport as 83% of emissions in this category come from fuel consumed by vehicles on the island. Fuel consumption by ferries and planes make up the remaining 17% of transportation related emissions. Long-established patterns of development, behavioral activities, practical efficiencies and cultural practices support personal vehicle use and altering these practices will be a substantial challenge.

The following strategy spotlights are categorized according to improvements in (1) infrastructure, and (2) policy and education.

Strategy Spotlights – Infrastructure

T.1. Increase Nantucket Regional Transit Authority (NRTA) Ridership (M)

A significant increase in the number of NRTA riders would go a long way in achieving reductions in emissions from transportation if riders transitioned away from private

vehicles. A small bus carrying as few as 5 to 10 passengers can displace 5 cars and result in a 60% reduction in fuel use for every mile traveled.[4]

In order to achieve significant reductions in fuel consumed for vehicle use, the Town must support the use of public transportation in a variety of ways, such as:

- ✓ Provide incentive programs for Town employees and private citizens to use public transportation.
  - o Cash-Out Program – offer employees a cash allowance in lieu of parking in or around the core area.
  - o Provide passes to employees.
- ✓ Fund supplemental public transit operations and capital needs annually through local sources.
  - o Add direct routes from additional satellite parking areas.
  - o Increase frequency on heavily used routes.
  - o Add service to areas where service currently does not exist.
- ✓ Expand service and add direct routes from additional satellite parking areas.
- ✓ Create policies that prioritize a reduction in car usage on the Island.
- ✓ Improve facilities including waiting areas, bus shelters and modernize vehicles and equipment.
- ✓ Marketing campaigns that encourage the use of efficient vehicles or alternative forms of transportation for vacationers, as well as summer and year round residents.
- ✓ Include costs for improving waiting areas and adding bus shelters in an annual capital plan
- ✓ Increase marketing efforts
- ✓ Expand methods for providing service information to users
- ✓ Offer Traffic Demand Management mitigation in exchange for parking waivers.
- ✓ Seek supplemental funding to expand the hours of operation of the downtown and beach routes.

T.2. Bike Friendly Nantucket (M)

Every trip a non-recreational cyclist takes replaces a car on the road and the fuel that vehicle would have been consumed for the trip. In order to encourage the use of bikes as a primary mode of transportation on the Island, bike travel must be as safe and convenient as possible.

The Town and the Nantucket Planning and Economic Development Commission (NP&EDC) have had an active bike path construction plan in effect since the early 1970's. While the Town has interconnected much of the bike path system, there are critical gaps remaining. The most challenging and controversial is creation of the so-

[4] A 60% reduction in fuel usage occurs if 5 cars that average 20 mpg are replaced by 1 bus that gets 10 mpg over the same distance.

called "In-Town Bike Path", connecting the downtown area to the rotary along Washington, Francis, Union, and Orange Streets. Gaps exist at the edge of town between Madaket Road and the mid-island area, a west of town corridor along Cliff Road, and in certain rural locations including Hummock Pond Road, Tom Nevers, and connecting to smaller village areas such as Wauwinet.

Specific actions to improve and expand Nantucket's bike path network include the following:

- ✓ Advance the permitting, right-of-way acquisition, and construction of the paths currently under design, such as the first phases of the In-Town and Hummock Pond Road bike path, and the second phase of the Prospect Street bike path.
- ✓ Increase capital funding when necessary for bike path projects, such as scheduling Proposition 2½ overrides.
- ✓ Reconstruct intersections to improve bicycle safety and crossing at key roadways
- ✓ Provide free or reduced cost bicycle safety gear including, but not limited to, lights and helmets.
- ✓ Install infrastructure along identified safe routes to schools.
- ✓ Set aside annual funding to purchase and maintain public bike racks.
- ✓ Provide areas for locking bikes at a variety of destinations, including schools, town buildings, bike paths, beaches, and ferry terminals.
- ✓ Provide space for child trailers to be parked and secured
- ✓ Involve businesses in providing incentives for bikers[5]

T.3. Parking Management (M)

Nantucket's population increase has resulted in a predictable rise in vehicle usage. Discussion about parking and congestion is broken into two parts: the downtown and the balance of the island.

T.3.1 Downtown Nantucket (M)

Maintaining the historic center of Nantucket's downtown as the "symbolic center of the island" has been a longstanding policy supported by practices of historic preservation, New England cultural patterns, and traditional neighborhood/new urbanism principals. Congestion and parking issues have plagued downtown since the 1950's and have been documented in numerous studies since that time. The Town has taken many steps to improve access to the downtown by alternative transportation modes and over the years, management activities, including one-way streets, enforcement of parking, and installation of signs. Downtown serves as the hub of necessary transportation activities connecting to vehicle and passenger ferries, public transportation, truck routes, deliveries to businesses – all factors which demand more active management of the

[5] For more information see the People's Pint Bike to Live Program in Greenfield, Ma. http://www.thepeoplespint.com/pages/BikeToLive.htm

limited circulation and parking infrastructure. To increase efficiencies and decrease emissions from congestion related idling and unnecessary vehicle miles, specific actions include:

- ✓ Introduce paid on-street parking to improve efficiency and generate revenue for enforcement and public transit activities.
- ✓ Create satellite-parking areas on outlying Town property with direct NRTA access.
- ✓ Create seasonal corridors in congested areas allowing only NRTA and residential vehicles to increase speed and predictability of NRTA buses servicing satellite-parking areas.
- ✓ Manage resident parking areas adjacent to downtown.
- ✓ Eliminate sidewalk parking on key pedestrian routes.
- ✓ Manage pricing throughout the downtown to achieve peak efficiencies.
- ✓ Create policies which reward use of smaller fuel efficient vehicles, such as reserved parking spaces
- ✓ Implement tax benefits, flexible scheduling, telecommuting, van pooling, and bike racks, showers, and lockers for employees (source: MassRides).
- ✓ Require managed transportation plans when granting licenses for large events.
- ✓ Where appropriate, remove on-street parking spaces that impede traffic flow.
- ✓ Where possible, widen right-of-way to accommodate bike and pedestrian use, on-street parking, and minimum travel lanes

T.3.2 Remainder of the Island (M)

Congestion problems occur at key intersections in the mid-island area near public schools and at the convergence of bike paths. Extensive parking problems have been observed at certain beaches, the mid-island grocery store, and in certain high-density neighborhoods.

Reducing congestion and improving safety at dangerous intersections would reduce idling vehicles and remove a disincentive to use bicycles. The following actions would reduce congestion:

- ✓ Evaluate and possibly reconstruct high-traffic intersections to reduce congestion and improve safety for bicyclists and pedestrians as identified in the Master Plan[6]:
  - o Sparks and Atlantic Avenue, Prospect Street, and Surfside Road
  - o Bartlett and Surfside Road
  - o Rotary at Milestone and Old South Road, Orange Street, and Sparks Avenue
- ✓ Support the establishment of village centers in the Country Overlay District (COD).

[6] See http://www.nantucket-ma.gov/Pages/NantucketMA_Planning/pubs

- ✓ Support the establishment of neighborhood centers in the Town Overlay District (TOD).
- ✓ Decentralize, where possible, activities that contribute to congestion and vehicle miles travelled.
- ✓ Create through-roads to remove bottlenecks and expand route choice to disperse traffic.
- ✓ Provide incentives for abutting property owners to consolidate vehicular access and provide interconnections between properties for vehicles and pedestrians.

Free parking in areas outside of the downtown serves to encourage private vehicle use as well. Revenue from parking could be used to fund public transportation and/or pedestrian and bicycle infrastructure improvements. Actions include the following:

- ✓ Expand resident sticker program for parking on public roads or property. Areas in Siasconset, Residential 5 (R-5) zoned neighborhoods, and certain publicly owned parking areas (parks, schools, open space, road shoulders, etc.) should be considered.
- ✓ Implement paid parking in mid-island and other commercial areas.
- ✓ Paid seasonal beach parking at Jetties and Surfside, including surrounding public roads.
- ✓ Lower the permitting threshold/provide incentives to encourage grocery delivery services.
- ✓ Provide incentives for businesses to encourage off-peak patronage.
- ✓ Relax zoning regulations for home occupations to reduce commuting.
- ✓ Provide incentives for abutting property owners to share parking.

T.4. Alternative Fuels (M)

In 2008 Massachusetts passed the Clean Energy Biofuels Act, which (1) offers preferred tax treatment for non-corn based alternatives to ethanol, (2) requires biofuel content in all diesel and home heating oil sold in the state, and (3) proposes new fuel standards that will encourage a range of emissions reducing technologies for cars and trucks. [7] Biofuel content is expected to start at 2% in 2010 and ramp up to 5% by 2013. Nantucket could realize additional emissions reduction benefits by increasing the biofuel mix of its fuel to the more common B20 blend in some of its fleet, including garbage trucks, maintenance vehicles, fire trucks and school buses.

Other than sourcing and storing the biofuel, no engine adjustments are required to run B20. Because of the energy required to plant and harvest soy and palm oil, converting to standard B20 (20% biofuel) results in a 15% reduction in emissions compared to

[7] For further information on the Clean Energy Biofuels Act go to the Mass.gov web page. http://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Energy%2C+Utilities+%26+Clean+Technologies&L2=Alternative+Fuels&L3=Clean+Energy+Biofuels+in+Massachusetts&sid=Eoeea&b=terminalcontent&f=eea_biofuels_biofuels_act&csid=Eoeea

conventional diesel fuel. Waste cooking oil (e.g. from Island restaurants) can also be burned directly as a "local biofuel". In this case the full 20% reduction in emissions can be claimed for each gallon of waste oil burned in vehicle. Since there may be an economic incentive for restaurants to donate their waste cooking oil, there may be a fuel cost savings from blending. In the City of Keene, New Hampshire all 77 of the city's vehicles, from fire engines to snowplows, are running smoothly on B20 biodiesel, preventing an estimated 12 metric tons of CO_2 from entering the atmosphere annually.

Massachusetts has set the goal of making these fuels available to the public by mandating that all diesel and home heating oil be blended with biofuel[8]. Even though these fuels are not yet readily available, it could be advantageous for the community to begin a discussion with the island fuel supplier. Consolidating demand for biofuel will help yield the scale necessary to store the fuel on island. Having shared storage facilities would help NRTA make the conversion to a biofuel blend.

T.4.1 Position Nantucket as a demonstration site for plug-in hybrid and electric car technology (M)

Plug-in hybrids and electric cars would most likely be charged in the night hours; therefore an opportunity exists for these electric cars to draw power directly from wind turbines. An integrated program with a large-scale wind farm or via National Grid could be of mutual economic benefit. Consider that wind flow is strongest and most consistent at night, when electricity used in homes and businesses tends to be low. Such a program could dramatically reduce Nantucket's transportation related emissions, depending on the rate of adoption of hybrid and electric vehicles. A pilot program could start with a community wind project, and then be expanded.

T.5. Trip Consolidation

Total vehicle miles traveled can be reduced by consolidating trips between outlying villages and common destinations, typically the downtown or mid-island. Car-pooling initiatives organized via internet sites such as Dividetheride.com have been successful in other communities. By deploying existing technology, one can imagine services ranging from "Stop and Shop Delivery", to demand aggregation for taxi services to and from the ferries and the airport. Organized vanpooling has been utilized by some businesses and can be encouraged.

T.6. Encourage fuel conservation for recreational boating (M)

Exploring waters around Nantucket by boat is a favorite pastime of many who visit and reside on Nantucket. Boaters should have efficiency and conservation in mind when engaging in recreational boating. Ideas for specific actions include:

- ✓ Speed limits

[8] See Clean Energy Biofuels Act

- ✓ Encouraging boat owners to maintain their engines and boats properly can enhance efficient use of fuel for recreational boating.
- ✓ A surcharge on the price of marine fuel could be imposed for use over certain thresholds to discourage frivolous use.

Strategy Spotlights – Policy and Education

T.7. Anti-Idling Policy (M)

Several cities have adopted anti-idling policies limiting the amount of time an engine may be running for town vehicles and any vehicles on town property or within a specified number of feet of a school property. The City of Denver conducted a successful pilot program with the use of a Vehicular Greenhouse Gas Tracking System on 146 city vehicles and 240 community vehicles. By tracking idling, rapid acceleration and braking, the city was able to cut idling by more than 35%, reduce emissions by 10% (as measured in CO_2/mile), and reduce fuel expenses[9]. According to the ICLEI Climate Air Pollution Planning Assistant (CAPPA) tool, reducing daily idling by one hour results in an annual savings of 900 gallons of fuel, or approximately $2,500 and 9 metric tons (mT) of CO_2.

The current Massachusetts state law[10] limits vehicle idling to no more than five minutes. The law does make some exceptions for vehicles that are making deliveries and need to run refrigeration or vehicles that need to run in order to operate machinery, for example. However, strict enforcement of idling policies by Town vehicles can reduce fuel costs, improve air quality, and reduce greenhouse gas emissions. According to the law, police, health officials, and all enforcement authorities have the ability to implement this policy. Penalties for ignoring this policy can range from $100 to $25,000. The foot police who monitor down town parking could enforce this policy. Also, the Town could educate the users of the Town fleet regarding the need to end idling.

T.8. School Bus Anti-Idling Policy (M)

The Massachusetts Department of Environmental Protection, (MassDEP), is working with school districts across the state to promote practical and effective actions for reducing our children's exposure to diesel pollutants as well as improve air quality. The state recommends the following steps to help reduce idling time at schools by school buses.

- ✓ Limit school bus idling time during pre-trip safety "circle checks."
- ✓ Direct drivers to turn off their buses as soon as they arrive in the schoolyard
- ✓ Provide a space inside the school where drivers who arrive early can wait, particularly during the winter.

[9] http://www.icleiusa.org/success-stories/copy_of_smart-transportation/green-fleets-1/denver-co-cuts-idling-and-emissions-in-city-vehicles

[10] M.G.L Chapter 90, Section 16 A

- ✓ Post "idling limit" signs wherever school buses park (see example to the right).
- ✓ Retrofit existing buses with pollution controls, and purchase new buses with cleaner burning engines.[11]

The Town could work together with both the schools and the bus companies to educate and implement these strategies. [12]

T.9. Green Fleet Policy (M, GCR)

The Town can pass a resolution that stipulates that any new municipal vehicle must be the most fuel-efficient and/or the lowest emissions vehicle available that will fulfill the necessary function of that vehicle. Fuel efficient vehicles generally do not cost more, for high mileage, hybrid vehicles should be considered. A Green Fleet policy for municipal and school vehicles is required for consideration as a Green Community, as is a plan for replacing vehicles that do not meet the new fuel economy standards. *Guidance and Model Policy for Purchasing Only Fuel Efficient Vehicles* can be found on the Green Communities Web site.[13]

T.10. Carbon Offsets (M)

Either in addition to or in lieu of the Sustainability Fund outlined in the following section (T.11.), Nantucket could decide that it will allow some of its reduction targets to be met with the purchase of carbon offsets. A carbon offset is a financial instrument that represents the reduction one metric ton of carbon dioxide equivalent (CO_2e). Offsets are allowed under almost every carbon regulatory scheme around the world, including the Kyoto Protocol, California's AB 32, the East Coast's Regional Greenhouse Gas Initiative (RGGI), the Western Climate Initiative (WCI), and the American Clean Energy and Security Act (ACES), which passed the House of Representatives in 2009.

Offsets can be an appropriate interim substitute for direct reductions if they meet the highest standards of quality and transparency. High quality carbon offsets (1) follow a widely recognized standard, such as the Climate Action Reserve (CAR) or Voluntary Carbon Standard (VCS), (2) are independently validated and verified, (3) are serialized and registered to prevent double counting, (4) are of an appropriate vintage (e.g. matched within reason to the year the emissions were generated, a 2010 offset for emissions generated in 2010, etc.), and (5) are sold by a party that provides transparency into the details of points 1 - 4. Both CAR and VCS have multiple project protocols, including those for landfills, livestock, and forest management, any of which

[11] Suggestions taken directly from the MassDEP website on Air & Climate http://www.mass.gov/dep/air/community/schbusir.htm

[12] In June 2008, Massachusetts passed the MassCleanDiesel program, which reduces air pollution from school buses. The retrofits available through this program improve local air pollution but do not result in reduced carbon dioxide emissions. For further information see the Massachusetts Dept. of Environmental Protection Air & Climate Web Site http://www.mass.gov/dep/air/diesel/masscleandiesel.htm

[13] http://www.mass.gov/Eoeea/docs/doer/green_communities/grant_program/buying_fuel_efficient_vehicles.doc

might be desirable for Nantucket. Cost can vary widely among high quality offsets but a reasonable range is between $10 and $20 per metric ton (mT). Offsets can be deducted as a business expense but not as a charitable contribution.

If Nantucket is going to set interim targets and measurements between 2010 and 2020, offsets are likely to be a necessary step in achieving those targets.

T.11. Airport / Ferry Sustainability Fund (M)

Nantucket Airport operates a full service Fixed Base Operator (FBO), which oversees landing and parking fees, along with fuel services. The Town, in partnership wit the Nantucket Airport, the Steamship Authority, and Hy-Line Cruises could consider launching a "sustainability fund" whereby fuel purchases or parking fees include the cost of the carbon emissions associated with commercial and private aircraft and ferry travel to and from the island. Contributions to the fund would be nominal compared to the cost of the mode of travel. The fund could be used to support energy efficiency measures or renewable energy projects elsewhere on the island. Marketing the program as a "Sustainability Fund" rather than an offset can help avoid some of the concerns and misconceptions about offsets.

Consider the example of balancing out the environmental impact from private air travel to and from the island by a contribution to the Fund: a private LearJet traveling round trip from New York's La Guardia airport will emit approximately 5.5 mT of CO_2. A retail carbon offset that would fund reductions projects elsewhere can sell for $15 per mT. Local reduction projects are likely to have a much higher cost per mT, but given that the former results in an $83 charge on the cost of a multi-thousand dollar trip, there is room to charge a higher cost per mT and still have the fee be an appropriately small percentage of the cost of the trip.[14]

As noted above, in addition to offsetting the impact of private air travel to and from the island, the mitigation fund could include consideration of the fuel usage to transport visitors arriving to the island via ferry or commercial aircraft. Travelers could volunteer to contribute to the sustainability fund commensurate with the impact of their travel. Suggested contributions for this program would be nominal, on average less than $5 for a ferry passenger and less than $10 for an airplane passenger.

High quality retail carbon offsets that meet internationally recognized offset standards can be purchased for $10 - $15 per mT, whereas the cost to reduce one mT of CO_2 on the island might cost upwards of $80 per mT or more. Therefore the sustainability fund might be better managed with a flat fee / contribution model determined by dividing the cost of targeted programs by the anticipated number of participants.

[14] A Lear Jet uses 250 gallons of fuel per hour. Flying time between LGA and ACK is approximately 1 hr and 10 min, or 2 hours 20 min RT. Using the emission factor of 21.1 lbs of CO2 per gallon of Jet A fuel burned, the emissions per hour are 5,275 lbs of CO2 for a total of 12,133 lbs or 5.5 mT of CO2.

T.12. Increase Town Police Bike Patrols (M)

Increasing the use of police bike patrols is one way for the Town to reduce transportation related emissions.

T.13. Optimize School Transportation Flows and Alternatives (M)

Optimization strategies for improving transportation flows and alternatives for Nantucket's schools include:

- ✓ Reinstate Bike to School / Work weeks
- ✓ Reconsider bus drop-off locations
- ✓ Educate and improve services to maximize the use of existing bus services

T. 14. Proper Tire Inflation Program (M)

Under-inflated tires can lower gas mileage by 0.3 percent for every 1 pounds per square inch (PSI) drop in pressure of all four tires. Thus, a vehicle running tires 5 to 10 PSI under-inflated is losing 1.5% to 3% fuel economy. Properly inflated tires are also safer and last longer.[15] Educating the public about proper tire inflation using well placed signage can ensure that vehicle tires are properly inflated at all times, especially after beach excursions.

T.15. Food Miles Concept and Strengthening Local Agriculture

Food Miles is a term that refers to the distance food is transported from farmer to consumer. It is often thought of as a way to judge the environmental impact of food. For example, if faced with the choice of an apple from Vermont or California, the Vermont apple would have fewer Food Miles associated with it as a result of that apple being produced on a more "local" scale.

Currently, the majority if energy in the U.S. food system is used in processing, packaging, transporting, storing, and preparing food. From farmer to consumer a piece of produce grown in the United States often travels 1200- 1300 miles. [16]While Nantucket's farmers cannot meet the Islands entire food needs, it is important to support the existing farms and growers, and to, where possible, support the expansion and strengthening of the agricultural infrastructure on Nantucket. Given the high cost of land on Nantucket resulting in the inability of many small growers to expand their operations in order to supply more locally grown food to the community, it would be advisable to support creative solutions to this problem. Experimental organic agriculture initiatives such ads the New Alchemy Institute have proven that it is possible, using organic growing

[15] For further information see the fueleconomy.gov website. http://www.fueleconomy.gov/feg/maintain.shtml

[16] For more information on the subject of Food Miles visit the National Sustainable Agriculture Information Service Website http://attra.ncat.org/farm_energy/food_miles.html

techniques, greenhouse technology and renewable energy to grow enough food sustainably, to feed 10 families, 365 days a year, on 1/10 of an acre of land.

HEATING AND GREEN BUILDING

In order to achieve its 2020 goal, Nantucket will have to make significant reductions in fuel oil consumption used for heating residential and commercial buildings. Residential heating accounts for 20% of total Island's carbon emissions, while heating of municipal buildings accounts for 40% of the Town's emissions. Like reducing vehicle miles on the island, there are many benefits from reducing Nantucket's fuel oil consumption, including reduced heating bills and creating jobs to implement weatherization programs. Changes to building codes can standardize energy efficiency and streamline application for state and federal funding opportunities.

Strategies for tackling emission reductions in heating use are categorized by (1) efficiency measures, and (2) education and policy.

Strategy Spotlights –Efficiency Measures

H.1. Weatherization (M)

According to the US Department of Energy, heating and cooling account for 50 to 70% of energy used in the average American home and inadequate insulation and air leakage are the primary causes of energy waste. Weatherization programs seal cracks around windows and doors, add insulation, and sometimes replace inefficient appliances, reducing energy-use-related Green House Gas (GHG) emissions and lowering utility bills. Studies suggest weatherization programs can save households 10-20% of annual energy costs. Assuming 10,000 households on the Island spending $1,800 per year for fuel oil and propane, it is reasonable to estimate $180 to over $300 per year in potential savings for each home that undertakes an aggressive weatherization effort.[17]

Weatherization is a two-step process of first caulking, sealing and weather-stripping all seams, cracks and openings to the outside. About one third of leaks occur through openings in ceilings, walls and floors, ducts and fireplaces are other significant culprits. Once all leaks are sealed, insulation is used to provide an effective resistance to the flow of heat.

The Mass Weatherization Assistance Program (WAP) helps low income household reduce their heating bills by providing full-scale home energy conservation services, using federal and state funding. Typical work completed includes air sealing, attic

[17] Assuming $3 per gal for fuel, 3,700 HH, and 2007 baseline fuel consumption.

and/or sidewall insulation, and weather-stripping. Funds from the American Recovery and Reinvestment Act (ARRA) are helping expand this program in 2010.

Simply educating island residents about the benefits of weatherization might motivate homeowners who can afford to finance their own payback period. The town could facilitate a weatherization lecture series where community members could come with questions about their buildings and leave with practical solutions. Experts could be invited as guest lecturers. Sponsoring organizations could include Sustainable Nantucket, Housing Nantucket and the Nantucket Housing Authority, to name a few. This could also be an opportunity for the Historic District Commission to offer information of its Sustainable Preservation building guidelines.

H.2. Installation of Programmable Thermostats (M)

Through the use of a programmable thermostat it is possible to adjust the times of heating and cooling of a building based on a pre-set schedule, reducing energy use and increasing savings. It is possible to save 10% per year on heating and cooling bills by turning thermostats back 10° - 15° for an eight-hour period.[18] Currently, the Town spends $429,016 on light fuel oil (not including schools) according to the emissions inventory. If the Town turned down the thermostats at night by 10° - 15°, this would result in a savings of approximately $42,000 per year.

H.3. Installation of Low Flush Toilets (M)

Traditional toilets use 3.5 gallons per flush (gpf). Newer low flush units can use between 1.6 and 1.0 gpf. These models tend to be more expensive than traditional models, however the extra cost is recouped in the savings associated with the cost of water. In a commercial facility that has roughly 30 flushes 260 days per year a traditional toilet would cost $110 in water usage compared with a low flush and ultra-low flush that would cost $50 and $30 respectively. As new toilets are needed in Town buildings they could be replaced with either a low flush unit or an ultra-low flush unit, saving energy and water. The same substitution should be encouraged for private residences.

H.4. Rain Barrels and Greywater Collection (M)

Rain Barrels are a simple technology that harvests rain water from roofs and collects them in barrels. This technique has been used through out history as a means for procuring water. By using rain barrels it is possible to collect usable water without using electricity. Without rain barrels, rain is absorbed into the ground and replenishes the aquifer. Once in the aquifer, the water is then pumped up into the building or home to be used on demand. Harvesting rainwater can cut out the use of a pump for uses that do not require potable water, such as garden irrigation.

[18] For more information go to the Governments Energy Savers Web Site for Thermostats http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12720

It will be necessary for the Town to determine the different external uses for which water is currently needed. Rainwater or greywater may serve a number of municipal needs now served by potable water such as town landscaping and washing town vehicles and boats. Once the need for external water is evaluated it will then be possible to determine the best locations for rain barrels or greater collection. If the Building Department building (a roughly 58'x52' building) were to harvest its rainwater, an annual average of 78,917 gallons of water per year could be harvested.[19]

Strategy Spotlights – Policy and Education

H.5. Adoption of State Stretch Code (M, GCR)

As of August 1, 2009 the state of Massachusetts has adopted Appendix 120 AA that is a more stringent energy code based on the International Energy Conservation Code 2009. This appendix to the existing code is the result of municipalities of Massachusetts requesting an energy code that creates higher standards than the one already in place.[20] The stretch code is a voluntary option for municipalities looking to reduce energy waste from buildings though its adoption is a necessary step in the application for Green Communities funding.

H.6. Luxury Building Mitigation Fund (M)

Similar to the Airport / Ferry Sustainability Fund discussed in T.10, Nantucket could manage a mitigation fund from high end development. For example, the program could require all new construction over a certain size to meet 20% of its energy demand through onsite renewable energy or pay a fee. Fee payments could also be generated from the installation of any new heated pools. This revenue could fund selected initiatives designed to reduce overall emissions.

Since launching its Renewable Energy Mitigation Program in 2000, the city of Aspen, Colorado has raised over $8 million for energy efficiency and renewable energy projects. REMP has two fees. One based on the size of the new home and the other based on whether or not the home has a non-complying exterior snowmelt, pool, and spa systems. The program charges new homeowners one fee if their homes exceed 5,000 sq. ft. and another fee up to $100,000 if they exceed the "energy budget" allotted to their property by the local building code. As of Fall 2002, REMP has raised more than $2 million for local energy efficiency and renewable energy projects. REMP's goal is to keep three tons of carbon out of the air for every excess ton of carbon put into the air.

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[19] Maximum Gallons of Rain Water Capture= (Annual Rainfall (42'')) X (Sq. Ft. of Roof (3000)) X (.623 gallons). For more information see Harvest H_2O website.
http://www.harvesth2o.com/Capture_System.shtml#top

[20] A copy of the Stretch Code can be found in the appendix of this document.

H.7. Low Interest Loans for Weatherization (M)

WAP may well serve a small portion of the Nantucket community but funding is limited and insufficient for the number of homes requiring retrofitting. It is likely that additional sources of funding will be necessary. The Town of Nantucket, with the assistance of National Grid or through the fund created in H.6., could encourage efficiency improvements by offering low or zero interest loans to building owners for improvements. For example, New York State offers home and multi-family building owner's loans at 4% below market for weatherization measures.

H.8. Promote Green Building Practices / LEED Certification (M)

Green Building practices take a holistic approach to environmental performance that includes water and energy efficiency, building materials, chemical usage, and transportation amenities. LEED (Leadership in Energy and Environmental Design) is a program of the US Green Building Council that recognizes the environmental performance of buildings and building professionals. Along with EPA's Energy Star for buildings, LEED offers a standard by which choices of windows, insulation, lighting systems, and heating and cooling systems allow for the most efficient building design. In addition to energy and water cost savings, there are paybacks associated with increased productivity and health.

Nantucket could offer lower building fees or expedited permit processing for buildings that meet LEED or Energy Star requirements.

ELECTRICITY

Residential electricity accounts for 10% of total Island emissions and electricity use in Town-owned buildings accounts for 20% of all municipal emissions. This section considers ways to reduce electricity usage through (1) efficiency, (2) conservation, and (3) renewables.

It is important to remember that efficiency and conservation are powerful tools – every kilowatt reduction achieved gets full credit for carbon reductions, and reduces the need for new electric power plants. Efficiency efforts can yield valuable reductions while the groundwork is laid for future deployment of renewable electricity sources.

Strategy Spotlights - Efficiency[21]

E.1. Efficient Lighting (M)

Moving to energy efficient lighting is one of the lowest cost ways to reduce electricity use and emissions. Inefficient incandescent bulbs are to be phased off the US market by 2012 and as a result, efficient lighting technology has advanced substantially. If using as little energy as possible is the goal, LED bulbs are the best option. Other things in LED's favor: they are dimmable, they turn on immediately, they offer a better quality of light, they last up to five times longer than CFLs and they don't contain mercury, which can be an issue with the disposal of CFLs.

As a versatile bulb that burns comparably bright to a standard incandescent, but still costs less over the long term and burns more efficiently, the CFL is still a good choice. CFLs use on average about 75% less energy than incandescent bulbs, and last 10 times longer. Nantucket families could save at least $30 in electricity and replacement costs for each bulb they switch. Replacing 500 incandescent bulbs with CFLs would produce an annual cost savings of $2,400 and a simple payback of 6 months. [22]

When deciding between CFLs or LEDs, bulb price, lifespan, lumens (brightness), and wattage/electricity cost (how much electricity it takes to light the bulb) are all relevant factors. Web based tools are available to help buyers determine what lighting is right for them. [23]

One-way Nantucket can encourage community members to purchase efficient lighting is to hold promotional CFL or LED bulb giveaway days. In addition to the efficient bulbs residents take home, a giveaway raises awareness of the benefits of efficient lighting, encouraging participants and their neighbors to buy additional bulbs on their own. Promotional giveaway programs can also be effective when coupled with other energy efficiency programs, such as low-income weatherization (see H.1.).

E.2. Install LED Streetlights (M)

Street lighting is often one of the largest items in a local government's energy budget. Many cities still have older, inefficient, mercury vapor lamps or incandescent bulbs in streetlights. LEDs have been used to successfully reduce energy use for traffic signals, and some cities are now choosing expanding their use to save energy from street lights. LEDs are highly efficient, and their light is directional, making it easy to focus them on roads, avoiding ambient light pollution and energy waste. LEDs produce better light quality than sodium lamps and provide better visibility of colors. Perhaps the most

[21] While none of these efficiency strategies are specifically required under Green Communities, they will all help the Town achieve a 20% reduction in energy use in 5 years, which is required under the program.
[22] ICLEI CAPPA Tool
[23] Productdose.com designed a light bulb comparison spreadsheet to help consumers determine when to purchase a CFL, LED or incandescent bulb. (http://www.productdose.com/LightBulb_Comparison.xls)

attractive feature of LEDs for local governments is the maintenance savings from their long life--10-12 years in streetlight applications.

According to ICLEI's CAPPA tool, replacing 100 streetlights with LED lights would avoid 17.5 mT of CO_2 emissions and yield $3,750 in annual energy savings and have a payback of less than three months[24].

E.3. Green Purchasing (M)

The Town should implement a green purchasing policy that would result in the purchasing of energy efficient appliances as well as sustainable and recycled products. Products could include recycled paper; energy efficient copiers, recycled content asphalt, concrete, or paint.[25] ENERGY STAR rated appliances should be required when replacing existing equipment. ICLEI's CAPPA tool can help buyers calculate the energy and cost savings from purchasing efficient appliances should be required when purchasing ranging from computing devices, kitchen appliances as well as heating and cooling systems.

Strategy Spotlights – Conservation[26]

E.4. Kill Phantom Loads (M)

Standby power, also called "phantom loads" refers to electric power consumed by electronic appliances while they are switched off or in standby mode. According to a McKinsey study, standby power alone is 6 to 8 percent of total energy consumption. [27] The biggest offenders include VCRs, TVs, computers, kitchen appliances and phone chargers. Phantom loads can be avoided by unplugging the appliance or using a power strip to cut all power to the appliance. SmartStrips are intelligent power strips that allow some appliances to be "always on" and empowering one appliance to trigger all others (e.g. when the computer is turned off, the printer, desk light and paper shredder are all powered off).

E.5. Promote the Use of Energy Measurement and Management Tools

When it comes to energy conservation, knowing really is half the battle. New tools and technologies are arming businesses and individuals with data about their electricity consumption, which in turn helps drive smarter choices about energy consumption. Tools for energy management include the use of smart meters, home and business energy calculators, and web based energy management tools. For example, OPOWER, which delivers energy savings to utility partners through large-scale customer

[24] Assuming 11 hrs of daily street light operation, $0.09 per kWh, and 928 lbs CO_2 per MWh.
[25] See King County, Wa. Environmental Purchasing Program website for more details. http://www.kingcounty.gov/operations/procurement/Services/Environmental_Purchasing/Policies.aspx
[26] While none of the conservation strategies outline are specifically required under Green Communities, many of these measures will help the Town achieve the required 20% reduction in energy use.
[27] http://www.mckinsey.com/clientservice/electricpowernaturalgas/US_energy_efficiency/

engagement. By teaching households how to understand their energy use, OPOWER has helped up to 80% of targeted households take energy saving actions.

Simple steps like using Smart Strips, motion activated lighting, daytime janitorial service, reducing phantom loads, and running large appliances at off peak hours can reduce islanders' energy bills and reduce emissions from electricity.

E.6. Participate in a Demand Response Program (M)

Demand Response is a specific form of energy management whereby participating businesses are paid to reduce energy use during peak periods. Massachusetts based EnerNOC is a leading provider of demand response services, as well as energy management solutions for businesses (www.enernoc.com). Comverge provides similar services for individual homes (www.comverge.com). The Town of Nantucket might want to consider whether some of its buildings could benefit from participation in a demand response program.

E.7. Implement Time-of-Use or Peak Demand Energy Pricing (M)

In cooperation with National Grid, the island could implement an energy pricing policy that would charge customers a premium for energy consumed during peak demand periods, such as daytime summer hours (targeting air conditioning usage). While participation in a demand response program outlined in E.6. serves as a carrot, peak demand pricing can act a stick – and one that can potentially raise funds for energy efficiency measures in collaboration with the local electric company. [Note: National Grid is a likely source of funds to implement efficiency measures.]

E.8. Promote water conservation through proper lawn maintenance (M)

Irrigated and manicured lawns require considerable amount energy to maintain. Encouraging native landscaping or creating policy to limit the amount of water allowed for irrigating lawns would reduce residential electricity demand.

E.9. Employee Energy Education Program (M)

In order to increase more awareness of energy conservation issues and practices, an education program could be administered where the connection between employee execution of practical measures and energy savings for their business or home will be addressed. As a result of this education program, employees would be empowered to alter their individual energy use, as well as identify environmental and financial benefits associated with these actions. One possible resource would be to look into a Carbon Challenge where employees would compete against one another to achieve the greatest reductions.

E.10. Climate Change Curriculum and Community Education

Educating young people about the science of Climate Change is one of the most effective tools in facilitating behavioral changes. The Massachusetts Department of Education's Science and Technology/Engineering Curriculum Framework includes many

learning standards, specifically in the earth sciences, which can be accomplished by utilizing materials that focus on the use of energy resources and climate change. A possible resource could be the School Curriculum Backpack offered by Clean Air- Cool Planet.[28]

E.11. Shade Tree Planting Program

All buildings absorb solar heat through windows and roofs resulting in an increased internal temperature. A landscape that incorporates shade trees into its design can lower solar heat gain. Deciduous tress, those that loose their foliage in the late Fall should be planted on south and west sides of buildings. This positioning helps protect the building from the directions that the sun is the strongest. Also, if an air conditioning unit were shaded it could increase the units' efficiency by 10%. Trees can also act as a wind block. All building owners should be encouraged to look at the advantages of shade tree planted when considering their landscape design.[29] Public shade tree programs should also be investigated.

Strategy Spotlights – Renewable Energy Generation

E.12. Renewable Energy Certificates (RECs) (M)

Renewable Energy Certificates represent the environmental benefits of renewable energy. RECs are sold separately from the energy itself and allow businesses and residents to claim ownership of renewable energy sources such as solar and wind without having to generate that energy themselves. Purchasing RECs will not reduce Nantucket's energy consumption, but as is the case with carbon offsets (T.10.), the town may decide it is appropriate to meet a portion of its electricity reduction target through the purchase of RECs. RECs can be purchased at prices ranging from $5 to $15 per MWh.[30]

It is worth noting that the environmental attributes of renewable energy can only be counted once, either towards the island's reduction targets, or for sale to a third party, who in turn will count those reductions towards their targets.

E.13. Renewable Energy Generation from Wind Power (M)

The island and surrounding waters have significant wind power potential. [31] The map below depicts wind speed estimates at 50 meters above ground as an indicator of suitability for utility-scale wind development.[32]

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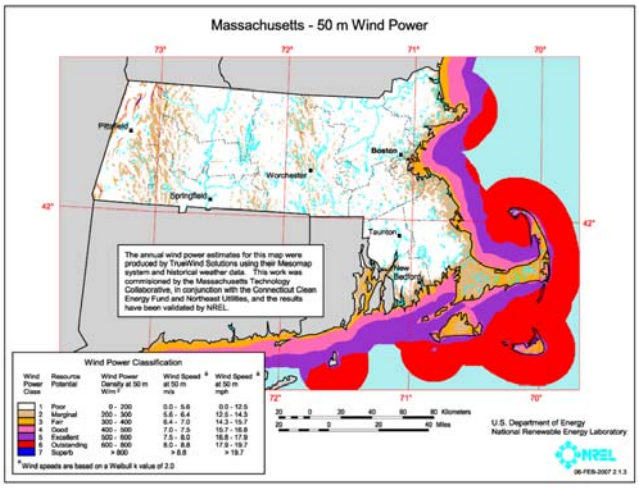
[28] For more information see the following website http://www.sciencecentercollaborative.org/backpack.php
[29] Energy Savers.gov http://www.energysavers.gov/your_home/landscaping/index.cfm/mytopic=11940

[31] With only an annual average of 52 days of sunshine per year, the island is less favorably designed for solar.
[32] Wind power map of the state of Massachusetts published by the US Department of Energy's Wind Program and the National Renewable Energy Lab (NREL).

Wind energy can come to Nantucket from three different project types: (1) offshore utility scale development; (2) onshore utility scale development; or (3) small community wind projects.



With Cape Wind on the horizon, a large-scale utility wind[33] project would not be appealing or necessary on Nantucket. This leaves the consideration of community wind projects and small-scale wind installations to power businesses or individual. Community wind projects have the possibility of reducing municipal electric bills as well as stretching the Towns budget in the following ways by avoiding the full retail cost of delivered electricity and the potential for additional savings through power purchasing agreements. These projects should be allowed by reducing barriers to their permitting and construction.

Resources for further investigation of community wind projects include the Cape & Islands Renewable Energy Collaborative[34], the Massachusetts Clean Energy Center[35] and the Island Institute,[36] which focuses specifically on the year-round island communities in the Gulf of Maine.

The cost and emissions reductions of small-scale wind installation make economic sense on a ten to fifteen year payback schedule. With a lower marginal cost of electricity as compared to utility rates, the owner of a home or farm scale wind turbine (100 kW capacity or less) is likely to payback his or her investment in a ten to fifteen year period.

One interesting comparison is to consider the cost of home and farm scale wind verses the purchase of RECs. Assuming $2,000 per kW capacity, purchasing and installing a 50 kW turbine will cost $75,000.[37] Assuming 30% capacity over a 15-year period, the cost of the energy generated from that turbine is approximately $50 per MWh. RECs can be purchased on the open market from anywhere between $3 and $10 per MWh. The REC however, does not factor in the cost of electricity. Assuming a retail electricity rate of $0.09 per kWh ($90 per MWh) over a 15 to 20 year time horizon, the economics of producing wind are favorable even to the purchase of RECs. (Note: the economics of

[33] Above 100kW, the distinction between community and utility-scale wind has to do with the ownership structure, where community wind projects are locally owned and optimize local benefits.
[34] www.cirenew.org
[35] http://masscec.com
[36] For further information on the Island Institute Community Wind Programs see their web page http://www.islandinstitute.org/communitywind.php
[37] http://www.windustry.org/how-much-do-wind-turbines-cost

wind projects change considerably if Nantucket is able to take advantage of State and Federal financing opportunities such as The Massachusetts Clean Energy Center's (MassCEC) Community-Scale Wind Initiative awards[38].)

E.14. Solar installations (M)

Town administration is working with private entities to explore solar sites on the island. By leveraging current tax incentives and attractive financing from solar developers, the Town and perhaps some residents could utilize on site solar energy with little or no upfront cost. While sunshine is not as abundant on the island as wind, solar installations are less obtrusive and therefore may be palatable for more locations.

E.15. Residential and Commercial Wind & Solar

The Town of Nantucket was a leader in adopting a Wind Energy Conversion Systems (WECS) Bylaw at the Annual Town Meeting in April of 1982. However, since that time the WECS Bylaw had not been updated to reflect new technologies or other relevant changes to the Zoning Bylaw. At the 2009 Annual Town Meeting significant changes to the WECS section of the Zoning Bylaw were adopted. Changes included expanding the zoning districts in which WECS are allowed, reducing the setback restrictions associated with WECS, relaxing the height requirement for roof or wall mounted WECS, and eliminating outdated requirements and standards that are not relative to newer technology. Residential WECS are now allowed by-right as an accessory use in all zoning districts. Commercial WECS are allowed by-right as an accessory use in the Commercial Industrial (CI) district and allowed by special permit as a primary use in certain large lot residential districts and certain commercial districts. Solar installations are exempted from local zoning regulations under Massachusetts State law.

Also in 2009, in order to assist residential homeowners and commercial business owners in their quest to green their buildings with wind and solar installations, local nonprofit Sustainable Nantucket, in partnership with Clean Air-Cool Planet and funded by the 11th Hour Project, collaborated with the Nantucket Historic District Commission to facilitate the drafting of a set of "green building" guidelines, entitled *Sustainable Preservation Guidelines*. These guidelines delineate the HDC's approach to renewable energy and energy efficiency inside, and outside of the Old Historic District, in new and existing buildings. The *Sustainable Preservation Guidelines* were formally adopted in October of 2009 and are among the first of their kind in the nation.

E.16. Zoning for Municipal Wind (M, GCR)

The intent of the recent Bylaw changes, mentioned above, in addition to providing much needed updates, were to ease permitting and remove obstacles that discourage wind generation. In order to encourage significant wind generation at a commercial scale, the WECS and Height Limitations sections of the Zoning Bylaw will require further changes. Furthermore, in order to qualify for Green Communities, the must pass an as-

[38] http://masscec.com/index.cfm?pid=11047

of-right by-law for renewable power generation (for more information see the Green Communities Web site[39].)

E.17. Pilot Program for Plug-In and Electric Vehicles Powered By Wind (See also T.4.)

Nantucket could become a demonstration site for plug-in hybrid and electric car technology. Wind flow is at its strongest and most consistent at night, when electricity used in homes and businesses tends to be low. With little nighttime demand, the value of power generated from midnight to 6 a.m. should be available at cheaper rates. Since, plug-in hybrids and electric cars would most likely be charged in the night hours, an opportunity exists for these electric car users to draw power directly from wind turbines. An integrated program with a large-scale wind farm or via National Grid could be of mutual economic benefit. Such a program could dramatically reduce Nantucket's transportation related emissions, depending on the rate of adoption of hybrid and electric vehicles. A pilot program could start with a community wind project, and then expand in partnership with a utility scale wind installation.

E.18. Wind Turbine Education Program, Nantucket Public Schools

Nantucket Public Schools is working with a wind committee (made up of educators, administrators, and sustainability professionals) to orchestrate the construction of a wind turbine located on school property. The turbine will serve two purposes; one, to reduce the energy bills of the school, and two, to be a tool for students in learning about green technologies, engineering, and the permitting process associated with the turbine. The committee is currently researching the possible cost savings and CO_2 reductions associated with the project. The turbine is scheduled for completion in the fall of 2010.

E.19. Planning Office and Renewable Energy Research (M)

Two major initiatives were begun in 2007: (1) coordinating with the Town of Edgartown to seek a Federal Energy Regulatory Commission (FERC) permit for a tidal energy demonstration project and (2) requesting a lease from the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) (formerly the Mineral Management Service (MMS) of the Department of the Interior) to study an area known as "South of Tuckernuck", a broad area between Tuckernuck, Muskeget and Chappaquiddick on Martha's Vineyard.

The NP&EDC is an active partner working with local, institutional, state and federal entities to create a Marine Renewable Energy Consortium (MREC) in this area between Nantucket and Martha's Vineyard. In addition, opportunity for renewable energy has become available with the passage of the state's Oceans Act, which allows for the development of an ocean management plan, an initiative that will most certainly involve the Commission's participation.

[39] http://www.mass.gov/Eoeea/docs/doer/green_communities/grant_program/model_wind_bylaw.pdf

On May 28, 2008, the Massachusetts Oceans Act (Chapter 114 of the Acts of 2008) was signed, setting forth a year long process of developing a draft plan for Massachusetts coastal waters followed by a six-month process of finalization and rule changes. Staff and Commission members have been active participants over the past year. A home rule petition was passed at the 2009 Annual Town Meeting (Article 67), which would give the NP&EDC regulatory authority over large-scale developments. The petition, now referred to as House Bill 1122, is under review. Ocean-related planning work continues initiatives from last year in the areas south and west of Tuckernuck and Muskeget islands.

Ocean-related planning work continues initiatives from last year in the areas south and west of Tuckernuck and Muskeget islands.

E.20. Geothermal heat pumps

Geothermal heat pumps can provide heat in the winter and air conditioning in the summer by harnessing solar energy stored beneath the earth's surface. They save money, reduce emissions, and are cost effective in replacing conventional heating and cooling systems. Residential geothermal heat pump systems are typically more expensive to install than other HVAC systems however, their greater efficiency means the upfront investment can be recouped in two to seven years. After that, energy and maintenance cost are much less than conventional systems plus they have aesthetic advantages, quiet operation, and free or reduced-cost hot water.

In October 2008, geothermal heat pumps became eligible for a 30% tax credit through the Residential Energy Efficient Property Credit Revenue Code.[40]

WASTE MANAGEMENT

When organic matter such as wood, paper, food, and yard waste is placed in landfills it decomposes aerobically, producing methane. Methane is a Greenhouse Gas that is 21 times as powerful as carbon dioxide. Emissions from waste on Nantucket accounts for 3% of the total emissions inventory. The Nantucket Solid Waste Recycling and Composting Facility is a model operation with an estimated 80% of materials recycled and diverted from landfilling. In order to achieve reductions from waste management, Nantucket will need to expand on the work that was already underway when the baseline was measured in 2007.

In April 2009, Waste Options together with Environmental Credit Corporation registered the first composting project with the Chicago Climate Exchange. Rather than more common landfill gas capture and destruction, the project generates credits by

[40] For more information, see http://www.energystar.gov/index.cfm?c=tax_credits.tx_index.

composting the waste stream. Because so much waste is composted, there is not much opportunity left to reduce methane emissions from the landfill.

W.1. Gasification (M)

[This section will be completed after further discussion with Waste Options]

W.2. Waste to Energy (M)

As a leader and innovator of waste management, the island might want to consider a waste to energy plant. While popular in Europe, trash-to-energy plants have met resistance in the U.S. The plants work by burning waste to heat a boiler to generate steam for a turbine, which in turn runs a generator to create electricity. Through this process, one ton of waste can generate 590 kWh of electricity.[41]

W.3. Transfer Station on the East Side of the Island (M)

A transfer station on the east side of the island would reduce the number of cars driving across the island on Saturday and Sunday to drop off waste at the landfill.

W.4. Reuse/Reduce Materials from Demolished Buildings (M)

Improved management of materials from demolished buildings will reduce the amount of waste shipped off the island.

W.5. Efficiency of Landfill Access and Uses (M)

The following are additional recommendations for reducing emissions at the landfill:

- ✓ Improve access to reduce idling vehicles
- ✓ Consideration of placement of landfill services to optimize traffic flows
- ✓ Encourage the use of clear, biodegradable trash bags

[41] http://www.nytimes.com/imagepages/2010/04/13/science/earth/13trash.html?ref=earth

GREEN COMMUNITIES REQUIREMENTS

Green Communities is a division of the Massachusetts State government that empowers cities and towns to reduce their energy consumption through energy audits, management and measurement tools, and the distribution of Green Communities Grants. In order to be eligible for a Green Communities grant, Nantucket must meet the following five criteria[42]:

1. Provide as-of-right siting in designated locations for renewable/alternative energy generation, research & development, or manufacturing facilities[43]
2. Adopted an expedited application and permit process for as-of-right energy facilities
3. Establish benchmark for energy use and developed a plan to reduce baseline by 20 percent within 5 years
4. Purchase only fuel-efficient vehicles
5. Set requirements to minimize life-cycle energy costs for new construction; one way to meet these requirements is to adopt the new Board of Building Regulations and Standards (BBRS) Stretch Code.

The Green Communities Web site has links to model by-laws and guidance for meeting each criterion. Once Nantucket has met these five criteria, the town can apply for grant money to fund projects that will reduce energy consumption (i.e. priority is given to efficiency and conservation measures rather than renewable energy projects.) Grant money is generated from the sale of allowances under the Regional Greenhouse Gas Initiative (RGGI). In 2010, the amount of grant money to be distributed was $7 million.

With regard to criterion #3, if Nantucket submits its 2007 baseline data, the 20% reduction in electricity use will need to be achieved by 2012. Alternatively, Nantucket could calculate a new baseline using the Green Communities MASSEnergyInsight tool[44], which will effectively reset the clock for another five years. It will be important to consider what energy conservation measures have been taken since 2007 to determine whether less time off a higher baseline is preferable to having more time but a lower baseline from which to measure reductions. Keep in mind, for the purposes of Green Communities, the scope of the baseline and reductions is **municipal energy use only**.

Furthermore, criterion #3 can only be met by reducing energy consumption. Substituting renewable energy sources or purchasing RECs or offsets will not count towards the 20% reduction target (this is not the case with the larger-scope ICLEI

[42] Green Communities Website
[43] Wind installation zoning needs to meet the needs of nameplate capacity of 600 kW or more. While actual outputs may vary, a wind turbine that is 250 feet tall will generate approximately 660 kW.
[44] ICLEI software is also acceptable for calculating a 2010 baseline, though for this purpose the MASSEnergyInsight tool might prove to be cheaper and easier to implement.

Climate Mitigation Program, which is targeted at carbon emissions reductions). The following strategies spotlight ways municipal Nantucket can achieve a 20% reduction in energy consumption of municipal buildings, vehicles, and street lighting within 5 years. See Appendices A, B, and C for references to each of these efficiency measure in more detail.

Municipal Buildings

- ✓ Switch to efficient lighting
- ✓ Weatherization measures
- ✓ Install occupancy sensors
- ✓ Install LED exit signs
- ✓ Institute a lights out and power off at night policy
- ✓ LED holiday lights
- ✓ Efficient lighting retrofits

Vehicles

- ✓ Green fleet policy
- ✓ Trip reduction

Street lighting

- ✓ LED street lights
- ✓ Decrease average daily time street lights are on

Appendix A
Actions, Costs and Priorities for Reducing Emissions from Transportation

Ground Transportation --> 20% reduction target	Cost	Impact	Spotlight	Agency
Municipal - short term				
Town anti-idling policy	Low	Med	T.7.	BOS
Optimize school transportation flows and alternatives	Low	Med	T.14.	School Committee
Encourage fuel conservation in recreational boating	Low	Med	T.11.	BOS
School bus anti-idling policy	Low	Low	T.8.	School Committee
Restrict idling at public facilities	Low	Low	T.7.	BOS
Encourage car-pooling, van-pooling, and NRTA use by municipal employees	Low	Low	T.1.	BOS / Chamber
Utilize fuel-efficient vehicles (e.g. bicycles) for parking enforcement	Low	Low	T.12.	BOS
Increase NRTA ridership	Med	High	T.1.	NRTA / BOS
Municipal - long term				
Green fleet policy	Med	Med	T.9.	BOS
Utilize alternative fuel vehicles for city fleet	Med	Med	T.4.	BOS
Parking management	Med	Med	T.3.	BOS
Community - short term				
Bike friendly Nantucket	Low	Med	T.2.	Various
Open local government alternative fueling stations to the public	Low	Med	T.4.	Private
Education on proper tire inflation at Wauwinet and other tire inflation spots	Low	Low	T.14.	Various
Food miles program	Low	Low	T.15.	Various
Local biodiesel	Med	Med	T.4.	Private
Trip consolidation technologies	Med	Med	T.5.	Private
Community - long term				
Promote community purchases of compact, hybrid and electric vehicles	Low	High	T.9.	Various
Other Transport --> 5% for airport, 2% for ferries target				
Airport				
Carbon offsets	Low	Low	T.10.	BOS / Airport
Anti-idling policy	Low	Med		Airport
Gasoline surcharge for private aviation to fund weatherization programs	High	High	T.11.	Various
Efficient taxi and runway management	Med	Med		Airport
Ferries				
Sustainability Fund for passenger contributions	Low	Med	T.6.	BOS / Various
Consideration of alternative fuels, biodiesel	Med	Med	T.4.	Steamship / Hy-Line
Port electrification	Med	Med		

Note for Appendices A - D: Items highlighted in yellow are strongly recommended; items in green are potential sources of funds. Agencies have been identified where appropriate / available. Not all recommendations are expanded upon in the plan and therefore do not have spotlight references.

Appendix B
Actions, Costs and Priorities for Reducing Emissions from Heating and Green Building

Heating (Target --> 20%)	Cost	Impact	Spotlight	Agency
Municipal - short term				
Pass the Stretch Code to the MA state building code	Low	High	H.5.	BOS
Install programmable thermostats	Low	High	H.2.	BOS / Town Admir
Promote and identify weatherization programs for municipal buildings	Low	High	H.1.	BOS
Encourage / Sponsor city staff to become LEED Accredited professionals	Low	Med	H.8.	BOS
Historic and Sustainable Preservation Guidelines	Low	Med		BOS / HDC
Install low flush toilets in municipal buildings	Med	Med	H.3.	BOS
Rain barrels and greywater collection	Med	Med	H.4.	BOS
Municipal - long term				
Luxury building mitigation fund	Med	High	H.6.	BOS
Perform energy-efficient building lighting retrofits	Med	Med	H.1.	Various
Incentives or mandates for LEED or ENERGY STAR new construction or retrofits	Med	Med	H.8.	BOS
Community - short term				
Promote weatherization programs	Low	High	H.1.	Various
Encourage the use of programmable thermostats	Low	Med	H.2.	Various
Provide green building information to the public	Low	Low	H.8.	Various
Energy Efficiency kits	Med	Med		Various
Loans for weatherization programs	Med	High	H.7.	Various
Community - long term				
Incentives or mandates for LEED or ENERGY STAR homes	Low	Med	H.1.	Various

Appendix C
Actions, Costs and Priorities for Reducing Emissions from Electricity Use and Renewables

Residential, Commercial and Industrial Electricity (Target --> 20%)	Cost	Impact	Spotlight	Agency
Municipal - short term				
Efficient lighting	Low	High	E.1.	BOS
As of right siting for wind generation and expedited permitting	Low	High	E.16.	BOS
Install building/office occupancy sensors	Low	Med	E.1.	BOS / Town Admin
Institute a "lights out when not in use" policy	Low	Med	E.4.	Town Admin
Decrease average daily time for street light operation	Low	Med	E.1.	Town Admin
Install energy-efficient exit sign lighting	Low	Med	E.1.	Town Admin
Green purchasing policy	Low	Med	E.2.	Town Admin
Participate in demand response programs	Low	Med	E.6.	Town Admin
Employee energy education programs	Low	Med	E.9.	Town Admin
Shade tree program	Low	Med	E.11.	BOS / Planning
Climate change curriculum in schools	Low	Low	E.10.	School Committee
Purchase green tags/renewable energy certificates	Low	Low	E.12.	BOS
Wind turbine education in schools	Low	Low	E.18.	BOS / School
LED street lights	Med	Med	E.2.	BOS
Implement time of use or peak demand energy pricing	Med	Med	E.7	BOS / National Grid
Municipal - long term				
Renewable energy research	Low	High	E.19.	Planning Board
Perform energy-efficient building lighting retrofits	Med	Med	E.1.	Planning Board
Improve water pumping energy efficiency	Med	Med	E.8.	Planning Board
Require energy-efficient vending machines	Med	Med	E.1.	BOS
Plug-in / electric vehicle demonstration project	High	High	E.17.	Planning Board
Community - short term				
Switch to energy efficient lighting	Low	High	E.1.	Various
Kill phantom loads	Low	High	E.4.	Various
Energy management and measurement tools	Low	High	E.5.	Private
Promote water conservation	Low	Med	E.8.	Various
Shade tree program	Low	Med	E.11.	BOS / Planning
Promote community green power purchasing	Low	Low	E.12.	Various
Promote community on-site renewable technologies	Low	Low	E.15.	Various
Energy Efficiency kits	Med	Med		Various
Community - long term				
Energy efficiency challenge programs (e.g. OPOWER)	Low	Med	E.5.	Private
Promote participation in a local green business program	Low	Med		Various
Promote the purchase of ENERGY STAR appliances	Low	Med		Various
Residential geothermal	High	High	E.20.	Private
Community wind installations	High	Med	E.15.	Various

Appendix D
Actions, Costs and Priorities for Reducing Emissions from Waste Management

Wastewater treatment, recycling and waste (Target 20%)	Cost	Impact	Spotlight	Agency
Municipal - short term				
Reduce / re-use materials from building demolitions	Low	Med	W.4.	Various
Efficiency of landfill use and access	Low	Med	W.5.	BOS / Waste Options
Municipal - long term				
Transfer station on east side of island	Med	Med	W.3.	BOS
Gasification	High	High	W.1.	Waste Options
Waste to energy	High	High	W.2.	BOS / Waste Options
Community - short term				
Use clear and biodegradable plastic bags for trash	Low	Med	W.5.	Private
Continue extensive recycling efforts	Low	Low		Private

Appendix E
Emissions Inventory Breakdown

	Tons CO_2e			Tons CO_2e		
Community + Municipal	**2000**	**2007**	**% of 2007 Total**	**2020 Baseline ("Do Nothing")**	**Action Plan Reductions from 2007 Levels**	**2020 Action Plan Target Emissions**
Residential Electricity	31,107	34,227	*10%*	35,586	-20%	27,382
Residential Heating	65,387	71,946	*20%*	74,803	-20%	57,557
Commercial Electricity	8,204	9,027	*3%*	9,385	-20%	7,222
Industrial Electricity	8,204	9,027	*3%*	9,385	-20%	7,222
Transportation Ground	164,074	180,533	*50%*	187,702	-20%	144,426
Transportation Air	14,932	16,430	*5%*	17,083	-20%	13,144
Ferries	18,469	20,322	*6%*	21,129	-20%	16,258
Waste	10,019	11,024	*3%*	11,462	-20%	8,819
Municipal	3,436	6,274	*2%*	6,523	-20%	5,019
Total	**323,832**	**358,810**	**100%**	**373,058**	**Result -->**	**287,048**
					Target -->	291,449

Municipal only	**2000**	**2007**	**% of Total**	**2020 Baseline ("Do Nothing")**	**Action Plan Reductions from 2007 Levels**	**2020 Action Plan Target Emissions**
Buildings Electricity	1,112	1,224	*20%*	1,273	-30%	857
Buildings Heat	2,266	2,493	*40%*	2,592	-50%	1,247
Fleet	543	598	*10%*	621	-30%	418
Water & Sewage	1,674	1,842	*29%*	1,915	-10%	1,658
Streetlights	93	102	*2%*	106	-50%	51
Employee commute	14	15	*0%*	16	-10%	13
Total municipal	**5,702**	**6,274**	**100%**	**6,523**	**Result -->**	**4,244**
					Target-->	5,132

Appendix F
Greenhouse Gas Emissions Inventory for the Town of Nantucket Prepared for The Town of Nantucket by Sustainable Nantucket

Emissions Inventory Methods and Data Sources

The baseline year for the Nantucket greenhouse gas inventory was 2007. The emission inventory and forecast, as well as most of the reduction measures, are separated into two distinct areas. The first is a **community wide assessment** of all energy and waste related activities that occur on this island. The community emissions data includes that from within the Town's borders such as vehicle tail pipes and heating broilers. The inventory required data and technical information to be collected from a wide range of sources including:

- Local Utilities: National Grid, Harbor Fuel, Sun Island Fuel, Waste Options
- Transportation surveys provided by the Nantucket Planning & Economic Development Commission
- Steamship Authority, Hy-line ferry, commercial airlines, and the Nantucket Memorial Airport

Community data gathered and entered into the software are general figures and not expected to be, nor can they be, completely accurate. Quantifying the consumption and emissions of the community over a period of time using the same methodology can be beneficial in that progress in the community can be recorded and monitored. The associated costs were generated from the internal records of the energy providers, such as the utility companies.

The second section of the inventory is an evaluation of emissions coming from **municipal operations**.

This includes building energy use, vehicle fleet emissions, Town generated solid waste, and other energy use such as outdoor/street lighting and water works operations.

A separate Town government-based inventory is conducted because the Town ultimately has greater control over its own emissions than private activities in the community. The Town can contribute directly to emission reductions through its own practices while setting an example for responsible energy and fuel use for residents and institutions within the community. The CCP program allows the Town to do just that, by showing emissions reduced and cost saved. The inventory required data and technical information to be collected from a wide range of sources including:

- Local Utilities: National Grid, Yates Gas, Harbor Fuel, Waste Options;
- Town of Nantucket Offices and Departments

- Public Schools
- Nantucket Cottage Hospital
- Police Department
- Fire Department

The data gathered will be expressed in eCO2 emissions, which consist of emissions associated with carbon dioxide, nitrous oxide, and methane. eCO2 is a measure that describes how much warming a given type and amount of a greenhouse gas may cause, using the functionally equivalent amount of carbon dioxide as a reference. For example, methane is 21 times more potent of a greenhouse gas than carbon dioxide on a molecule-by-molecule basis. Therefore, 1 ton of methane has an equivalent CO2 value of 21 tons.

The data was entered into specialized software designed by ICLEI and Torrie Smith Associates. The CCP software calculates eCO2 from energy use and other inputs and also translates all energy units into British Thermal Units (BTU's) for comparison between energy sources. BTUs are a unit of energy that allows comparisons across various types of energy. Every different energy source (such as natural gas, electricity, diesel, gasoline, etc.) has a natural amount of energy embedded within it. British Thermal Units standardize the amount of energy embodied in these different fuels comparisons can be made amongst their energy content. For example, when we determine the energy content in electricity (in BTUs) and in natural gas (in BTUs), we can compare and sum these figures. The energy costs associated with each category were taken from the energy providers' bills kept on record at the appropriate Town department.

Community Emissions Findings

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Residential			
Nantucket, Massachusetts			
All Residential			
Electricity	34,227	9.7	310,580
Light Fuel Oil	38,179	10.8	461,859
Propane	33,767	9.6	466,524
Subtotal All Residential	106,174	30.1	1,238,963
Subtotal Residential	106,174	30.1	1,238,963
Commercial			
Nantucket, Massachusetts			
sm. commerical/ industrial			
Electricity	9,027	2.6	81,911
Subtotal sm. commerical/ industrial	9,027	2.6	81,911
Subtotal Commercial	9,027	2.6	81,911
Industrial			
Nantucket, Massachusetts			
lg. commerical/industrial			
Electricity	9,027	2.6	81,911
Subtotal lg. commerical/industrial	9,027	2.6	81,911
Subtotal Industrial	9,027	2.6	81,911
Transportation			
Nantucket, Massachusetts			
Ferries			
Diesel	20,322	5.8	234,327
Subtotal Ferries	20,322	5.8	234,327

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	
Private and Commercial Jets/Planes				
Gasoline	2,674	0.8	31,401	
Diesel	13,773	3.9	158,618	
Subtotal Private and Commercial Jets/Planes	16,447	4.7	190,019	
Road Vehicles				
Gasoline	149,454	42.3	1,748,452	
Diesel	31,667	9.0	364,841	
Subtotal Road Vehicles	181,121	51.3	2,113,293	
Subtotal Transportation	217,890	61.7	2,537,639	
Waste				
Nantucket, Massachusetts				
Waste Options				*Disposal Method - Managed Landfill*
Paper Products	4,319	1.2		
Food Waste	8,062	2.3		
Plant Debris	-493	-0.1		
Wood/Textiles	-864	-0.2		
Subtotal Waste Options	11,025	3.1		
Subtotal Waste	11,025	3.1		
Total	353,142	100.0	3,940,425	

Municipal Emissions Findings

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Buildings				
Nantucket, Massachusetts				
Schools				
Electricity	709	11.3	6,429	315,245
Light Fuel Oil	1,176	18.7	14,221	235,912
Subtotal Schools	1,884	30.0	20,651	551,157
Town Accounts				
Electricity	516	8.2	4,678	252,643
Light Fuel Oil	1,318	21.0	15,943	429,016
Subtotal Town Accounts	1,833	29.2	20,621	681,659
Subtotal Buildings	3,718	59.2	41,272	1,232,816

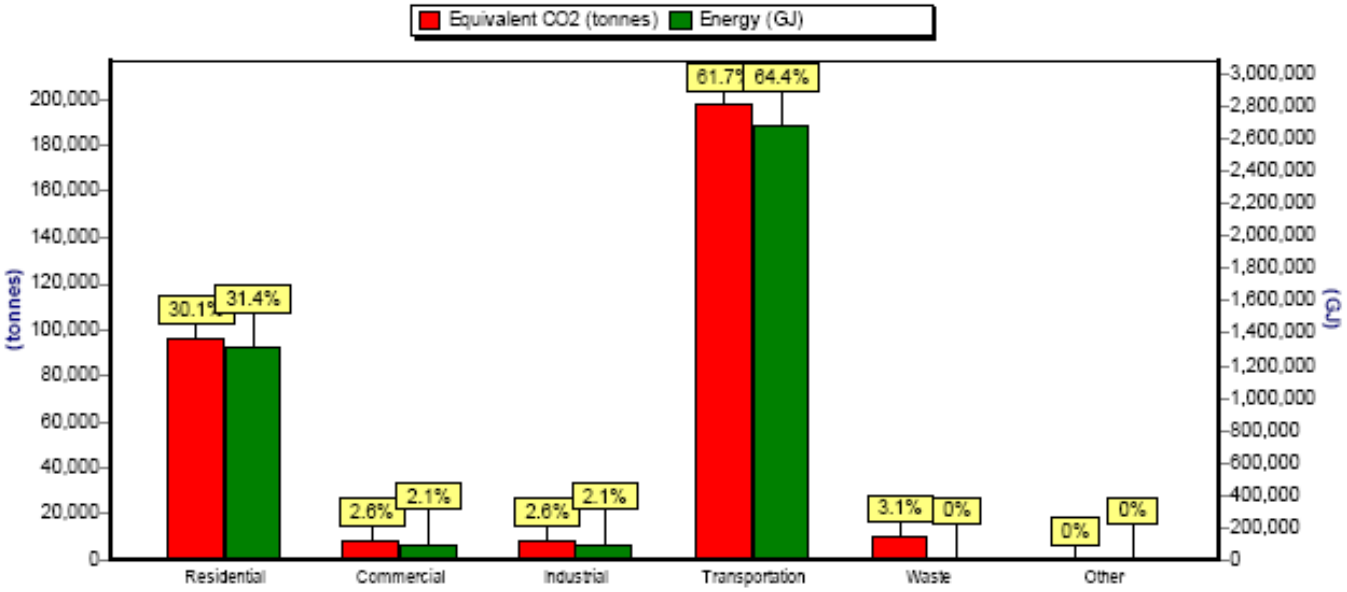
	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Vehicle Fleet				
Nantucket, Massachusetts				
Town Fleet				
Gasoline	499	8.0	5,847	212,480
Diesel	100	1.6	1,149	43,520
Subtotal Town Fleet	599	9.5	6,996	256,000
Subtotal Vehicle Fleet	599	9.5	6,996	256,000
Employee Commute				
Nantucket, Massachusetts				
Town Employees				
Gasoline	15	0.2	176	
Diesel	0	0.0	0	
Subtotal Town Employees	15	0.2	176	
Subtotal Employee Commute	15	0.2	176	
Streetlights				
Nantucket, Massachusetts				
Untitled				
Electricity	102	1.6	924	73,848
Subtotal Untitled	102	1.6	924	73,848
Subtotal Streetlights	102	1.6	924	73,848
Water/Sewage				
Nantucket, Massachusetts				
Town of Nantucket				
Electricity	1,773	28.3	16,088	1,330,894
Light Fuel Oil	69	1.1	835	20,081
Subtotal Town of Nantucket	1,842	29.4	16,923	1,350,975
Subtotal Water/Sewage	1,842	29.4	16,923	1,350,975
Total	6,275	100.0	66,290	2,913,639

Inventory Results

The greenhouse gas (GHG) inventory measured emissions based on two separate studies. The first was a measure of all emissions from the Nantucket residential and commercial community. (Fig. 1) The second level of the inventory investigated the emissions from municipal operations. (Fig. 2)

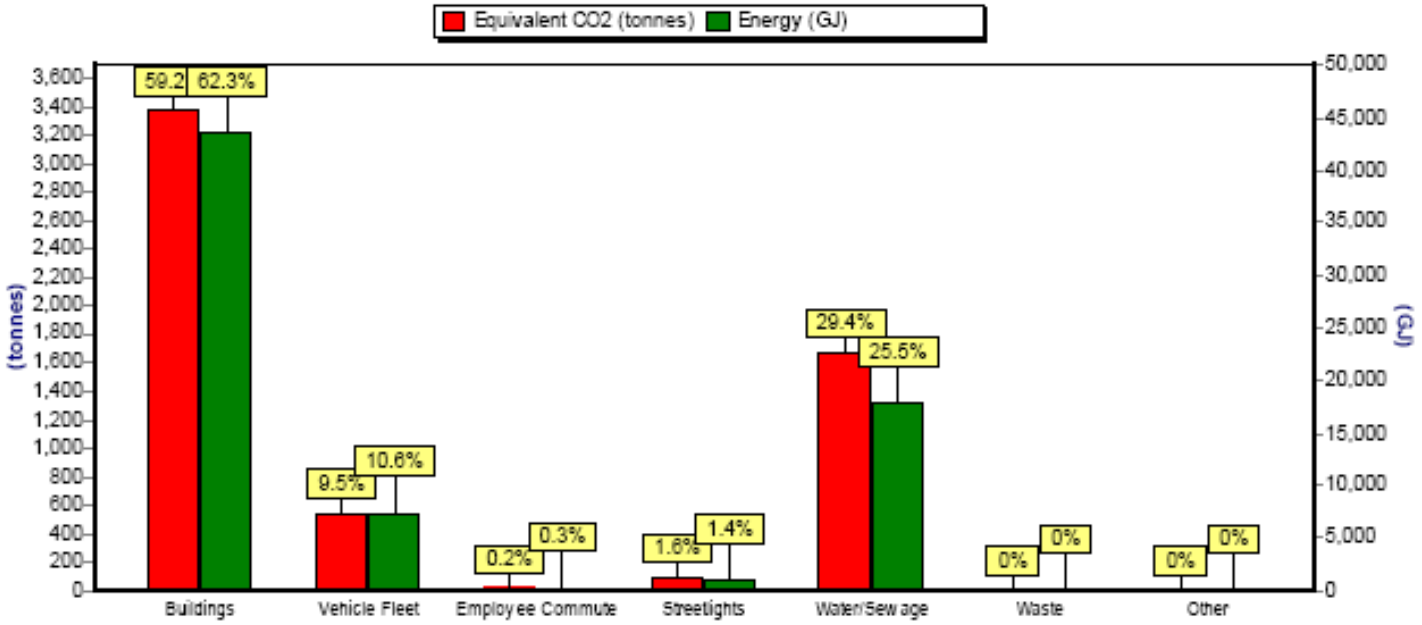
In 2007, the community of Nantucket's greenhouse gas emissions totaled 353,142 tons of eCO2. Transportation energy use accounted for 64.4% and residential household energy use accounted for 31.4% of the communities' emissions. Gasoline used for transportation was the largest overall source of eCO2. Light fuel oil and electricity produced large quantities of eCO2 after gasoline (38,179 tons and 34,227 tons eCO2 respectively).

Fig. 1 – Community Emissions Inventory Results



In 2007 the Town of Nantucket generated 6,275 tons of eCO2, 59.2% of which came from building energy use (Figure 2). ECO2 emitted by the public schools accounted for 1,884 tons, or 30 % of this total, and ECO2 emitted by other town buildings was equal to 1771 tons, or 29% The municipal water/sewage, vehicle fleet, and streetlights/traffic lights accounted for 29.35%, 9.5%, and 1.6% respectively, of the remaining emissions. In 2007, the Town of Nantucket spent a total of $2,913,639 on energy.

Fig. 2 – Municipal Emissions Inventory Results



Forecasting

Between April 1, 2000 and July 1st, 2007, Nantucket's population expanded by 10.5%.[45] With the 2008 economic recession in mind, we are projecting Nantucket's population growth rate between 2008 and 2020 at 50% of the rate of the previous 7 years, or 5.3%. Based on this growth rate and utilizing the Energy Use Growth Forecast Tool provided by the U.S. Department of Energy's *Energy Information Association* (EIA),[46] our total energy use as a community could grow by 6.42%. Correspondingly, if unchecked, our community's carbon emissions would rise from 353,142 tons of eC02 in 2007 to 375,813 tons of eC02 by 2020.

Targets for reduction

The 2nd Milestone of the ICLEI Cities for Climate Protection Campaign is to set targets for reduction of greenhouse gas emissions. We recommend that Nantucket's initial target be to reduce our emissions by **10% below 2000 levels by 2020**. This would mean reducing our overall GHG emissions from 380,302 tons of eC02 emissions in 2007, to

[45] U.S. Census Bureau. http://quickfacts.census.gov/qfd/states/25/25019.html

[46] Data Source: US DOE Energy Information Administration
http://www.eia.doe.gov/oiaf/aeo/supplement/supref.html

294,392 tons by 2020[47], an overall reduction of 86,000 tons from 2007 levels, and a reduction of 110,325 tons from our projected total carbon emissions in 2020, if no steps were taken.

While the state of Massachusetts set targets in the 2004 Massachusetts Climate Protection Action Plan, which aim for the reduction of greenhouse gas emissions in Massachusetts by at least 10% below 1990 levels by 2020, we believe Nantucket should set it's own tough, yet realistic targets for reduction that take into account our high rate of population expansion --36.8% from 1990 to 2000, in comparison to the state's expansion of 5.2% in that time frame, and 10.5% from 2000 to 2007 in comparison to the statewide average of 1.6%.[48]

For longer-term targets, we suggest reducing emission to 25% below 2000 levels by 2030, 55% by 2040, and 75-80% by 2050. This timeline for reduction would put us roughly in line, with the state of Massachusetts long-term targets of a 75 – 80% reduction from 1990 levels, by the target date recommended by the Union of Concerned Scientists, which is 2050.[49]

[47] According to the Energy Use Forecast Tool provided by the U.S. Department of Energy's *Energy Information Association* (EIA)

[48] U.S. Census Bureau, State and County Quick Facts (http://quickfacts.census.gov/qfd/states/25/25019.html)

[49] At a population expansion rate in Massachusetts as a whole of 6.8% between 1990 and 2007.