Master Plans, Zoning Ordinances, and Site Regulations in Support of Clean Energy

Elena Piekut

Assistant City Planner, Zoning Administrator

Staff Liaison, Dover Energy Commission

City of Dover, NH

June 1, 2019

The Ideal in Planning Process

- Visions, goals, and subsequent regulations come from the people
- Those people represent various interests and points of view
- The majority buy in to those visions and goals
- Appeal to multiple concerns
 - Not just climate change



- A Master Plan effectively supports Zoning Ordinance, regulations, capital improvements
 - "The master plan shall...give legal standing to the implementation of ordinances and other measures of the planning board. Each section...shall be consistent with the others in its implementation of the vision section." (RSA 674:2.11)
- Plan, Ordinance, and Regulations support, incentivize, perhaps *require* transition to a **more efficient, cleaner energy landscape**

The Importance of the Master Plan



- *Required* prior to adopting a Zoning Ordinance or Capital Improvements Program (CIP)
 - Supports Zoning Ordinance and vice versa
 - Supports CIP and vice versa
- Provides goals and actions for municipality to pursue

- Make it easy to say yes!
 - When work and goals are documented, their importance is demonstrated
 - Win points in grant applications

The Master Plan

- Minimum of two sections:
 - Vision
 - Documents the desires of the citizens
 - Identifies guiding principles and priorities to implement that vision
 - Land Use
 - Translates the vision into physical development goals
 - Identifies existing conditions, data
 - Proposes ideal location, extent, and intensity of future land use



The Master Plan

- Additional optional sections:
 - Transportation
 - Community Facilities
 - Economic Development
 - Natural Resources
 - Natural Hazards
 - Recreation
 - Utilities
 - Cultural, Archaeological, and Historic Resources

- Regional Concern
- Neighborhood Plan(s)
- Community Design
- Housing
- Implementation
- Energy
- Coastal Management

The Master Plan

- Dover's sections:
 - Vision 2012
 - Land Use Analysis 2015
 - Transportation 2016
 - Stewardship of Resources 2017
 - Conservation and Open Space 2012
 - Recreation 2009, 2019
 - Community Facilities & Utilities 2009
 - Climate Adaptation 2018

- Updating the Master Plan
 - Most updated every 5, 10, 20 years
 - Dover updates on a rolling basis

The Ideal – The Master Plan

- A 10-year plan decays as a whole
- A rolling plan allows topics to be introduced, revisited, evolve
 - Energy subsection first introduced in Land Use Chapter (2015)
 - Energy concerns naturally permeate Transportation Chapter (2016)
 - Energy subsection revisited in Stewardship of Resources (2017)
 - Energy subsection revisited in Climate Adaptation Chapter (2018)
 - Energy will figure in Recreation Chapter (2019), then Community Facilities & Utilities Chapter (next up)
- A rolling plan will engage more and more diverse volunteers

The Ideal – The Master Plan

- Examples of <u>actions</u>:
 - Build a "Smart City" including EV charging
 - Develop an Alternative Energy Ordinance
 - Support regional task force on tidal power

- Ę
- Investigate off-grid/hybrid energy for emergency shelters
- Identify regulatory and financial barriers to renewable energy generation
- Actions identify responsible party and priority level
- Actions identify relevance to various topic areas

Action Items		Climate	Interplay Among Other Climate Topics						Deinsites	Responsible
		Topic	WAQ	HS	F	Е	I	NR	Priority	Party
42	Revisit and revise impervious surface thresholds and stormwater regulatory measures as necessary	WAQ	х				х	х	S	Energy Commission and Planning Department
43	Explore land use regulatory options that would encourage local food production ('agrihoods'), community gardens, and additional conservation land to be built within new residential subdivision housing developments in appropriate areas	F			х		х		s	Planning Department
44	Conduct a regulatory audit of the City's existing site regulations to ensure that future electric vehicle charging stations are allowed and can be installed/located, as well as encourage the development of additional electric vehicle infrastructure as future demand dictates	Е				x	х		s	Planning Department
45	Consider adopting a property tax exemption or providing incentives to property owners in order to promote alternative energy sources, and facilitate future investments in energy efficient upgrades and reduction efforts	Е				x	х		s	City Council
46	Compare the City's current floodplain ordinance with the Office of Strategic Initiative's (OSI) updated model ordinance to ensure regulations and performance standards are adequate	Ι		х			х		s	Planning Department
47	Explore regulatory options that would allow the City Council to initiate mandatory water restrictions on private and public property, as deemed appropriate, during a prolonged drought	WAQ	х	х				х	I	Utilities Commission and City Council

WAQ: Water Availability and Quality HS: Health and Safety F: Food E: Energy I: Infrastructure NR: Natural Resources

Implementation & Collaboration

- Get others in on the action
 - Involve responsible parties in reviewing actions
 - Hold them accountable once plan is adopted
 - Point back to the plan!
- Ex.: Advocating for Offshore Wind Energy Development
 - Community approached Energy Commission with resolution
 - Energy Commission brought resolution to City Council
 - We can point to multiple relevant action items through Master Plan chapters
 - Three layers of community support for Council's unanimous resolution

Implementation - Zoning

- Permissive approach to solar
 - Often no different than an outbuilding
 - Solar is considered an accessory use
 - Not really impervious
 - Few issues with opposition
- Redefined "gas station"
- Transfer of Development Rights & Efficient (Small) Housing
 - Master Plan guides Zoning Ordinance
 - Zoning Ordinance allows for Transfer of Development Rights
 - TDR proposals must be found consistent with Master Plan
 - Master Plan encourages efficient development



Implementation – Zoning Opportunities

- Permissive, thoughtful approach to solar
 - Codify practice/policy where appropriate
 - Clarify relationship to building height?
 - Clarify concerns regarding impervious surface
 - Decide whether allowed in front yards
 - Clarify use and structure category, principal vs. accessory
 - A residential use? A commercial use? A natural resources use?
 - Relationship to farmland
- Think about it, but don't overthink it. Gray is okay.

Implementation – Site Review & Subdivision

- Currently incentivizing EV charging stations
 - Paved area fee is halved if 2% of parking spaces are EV charging stations
- New solar requirements
 - All new CBD buildings must be "solar ready"
 - CBD buildings over 25,000 sf must include rooftop solar



Solar ready—what's wrong with this picture?

Implementation – Site Review & Subdivision

- Are there more attractive or reasonable incentives?
- Review NHSEA Model Solar Ordinance
- Is it time for an Energy Chapter of the Master Plan?

Implementation – Data Analysis

- 2018 Energy Report
 - Energy Commission analyzed data from Finance Department
- 2018 UNH Sustainability Fellowship
 - UNH Fellow Jackson Kaspari, BS Chemical Engineering '18
 - First in North America combined GHG & Nitrogen Inventory of Local Government Operations (including schools)
 - SIMAP tool is available to campuses and municipalities
 - Baseline data to establish 100% renewable goal



Turning Local Energy Planning Into Action

Jamie Hess New London Energy Committee June 1, 2019

MAJOR ENERGY MILESTONES

2007: Formation of Energy Committee
2011: Add energy chapter to Master Plan
2014: First outreach campaign
2016: First municipal project
2018: Set 100% renewable energy goal
2019: Begin drafting new Master Plan

2011 MASTER PLAN – GOALS

- * Promote energy conservation & efficiency
- * Reduce energy costs
- * Improve energy infrastructure
- * Increase the use of local and sustainable resources
- * Develop a baseline of understanding on energy use
- * Recommend changes to town policies, zoning ordinances, development patterns, and rules & regulations, in order to reduce energy consumption

MASTER PLAN RECOMMENDATIONS

- * Identify cost-effective energy efficiency retrofits
- * Consider the full life cycle cost of new equipment
- * Seek out funding sources and grant opportunities
- * Consider property tax exemptions for renewables
- * Develop new zoning ordinances and regulations to encourage renewable energy generation
- * Adopt a 'green' building code
- * Expand public transportation, sidewalks, bike paths
- * Host educational events to foster energy awareness
- * Collaborate with schools & Colby-Sawyer College

WHAT WE'VE DONE

- * Energy chapter in Master Plan (2011)
- * Solarize initiative (2014-15)
- * LED streetlight upgrade (2016)
- * Electric Vehicle Expo (2016)
- * Energy & Environment Expo (2018)
- * Electric Vehicle Expo II (2018)
- * Weatherize Kearsarge campaign (2019)
- * 100% solar tax exemption approved at Town Meeting (2019)
- * \$30,000 energy efficiency capital reserve fund approved at Town Meeting (2019)

SOLARIZE CAMPAIGN - 2014

- * 37 homeowners signed contracts
- * Dozens more homes went solar in subsequent years

LED STREETLIGHT UPGRADE - 2016

- * \$10,000 upfront cost after rebate
- * \$8,000 per year savings
- * Paid for itself in 15 months

New London Energy Committee ELECTRIC VEHICLE EBARDON Sunday 9/11/16 12-4pm FREE

On September 11th, step into the future of sustainable transportation. Experience the thrill of riding or driving an electric car or bicycle. Drive a BMW i3, BYD e6, Chevy Volt, Nissan Leaf, Tesla Model S or Model X. Learn how to charge your car with free electricity from rooftop solar panels. Meet with enthusiastic electric car owners and local solar installers. New London Historical Village buildings will be open all afternoon; Take a look at our past while you're here to see the future! FREE admission - FREE refreshments - FREE raffle for registered attendees.

2016 EV Expo



2018 EV Expo



Electric cars average 100 mpg. * No noise.

- * No exhaust.
- * \$7500 tax credit.

Low maintenance: * No oil changes. * No antifreeze. * No radiator. * No muffler. * Brakes last for the life of the car.



2018 Tesla Model 3



1976 Electric Jeep CJ5



2017 Tesla Model X



2012 Chevy Volt

If you're not ready for an electric car, how about an electric bicycle or motorcycle?

Top speed 28 mph Range up to 40 miles

Top speed 98 mph Range up to 206 miles

Replace your gasoline-powered yard equipment with electric models:

- * Lawnmowers
- * Chainsaws
- * Snowblowers
- * Leaf blowers
- * Weed whackers
- **Zero Maintenance:**
- * No need to winterize
- * No more spring tune-ups

Kearsarge Region ENERGY & ENVIRONMENT EXPO

Saturday, April 7 10 am - 3 pm

Mercer Gym, Colby-Sawyer College New London, NH

- * Renewable Energy
- *** Energy Efficiency**
- * Earth-Friendly Living FREE Admission

Hosted by: Kearsarge COA Climate Action Group New London Energy Committee Andover Energy Group Vital Communities

> For information: Joe Kubit, 603-748-4404 jgkubit70@gmail.com Jamie Hess, 802-291-3939 nordicskate@gmail.com

Free energy-efficient LED light bulbs to the first 25 participants through the door!

Why convert to LED Light Bulbs?

* LOW PRICE – under \$2 * LONGER LIFE – Last 10 to 20 years

* SAVE ENERGY – 85-90% savings over incandescents

* SAVE MONEY – \$60 per bulb in lifetime savings
* NHSAVES REBATE



Install energy-efficient appliances

Refrigerator Washer & Dryer Air conditioner Air purifier Dehumidifier Pool pump



Cost: \$300 to \$1000 NHSaves rebate: \$20 to \$200

Upgrade to heat pumps

- * Water heater
- * Mini-Splits
- * Geothermal



Heat Pump Water Heater

Cost: \$1500-\$2000 NHSaves Rebate: \$500-\$600



'Mini-Splits' are cold-climate air-source heat pumps that deliver both heating and air conditioning

Indoor unit





Outdoor unit

Cost: \$3000 - \$4000 NHSaves rebate: \$400

Geothermal systems are ground-source heat pumps. They require a deep drilled well or a horizontal well field and are designed to heat an entire house.

> Control unit

Cost: \$20,000 to \$40,000





Sign up for a professional home energy audit Audit costs only \$100, refundable if you weatherize Work consists of air-sealing and insulation Eligible for 50% rebate from NHSaves - up to \$4000 Low-cost financing available Save money on your heating bills

Weatherizing starts with insulating your attic



Then air-sealing your basement with spray foam. **Especially** filling gaps where the sills rest on your foundation.



Energy Summary Report

Your Energy Summary report addresses the recommendations for improving the comfort, safety and energy efficiency of your home. Use this report as a guide for deciding which recommended measures you want to have performed. Your contractor will be able to answer any questions you may have; can explain the specific benefits of each improvement, and can help you prioritize which improvements to undertake first. Please note that the estimated savings values listed in this report are based on program values established for typical New Hampshire homes and may not reflect the actual savings realized for your home.

Your contractor is ready to implement these recommendations promptly, and shall guarantee materials and workmanship for two years from the date of installation.

		ESTIMATED VALUES**				
Proposed Improvement	Customer Co-Pay	Energy Savings	Pay Back Period (years)	Customer Cost Savings (\$/year)		
AC Ancillary Savings	\$0.00	46 kWh Electric	0.0	\$8.20		
Boiler Ancillary Savings	\$0.00	9 kWh Electric	0.0	\$1.61		
LED Bulbs	\$0.00	296 kWh Electric	0.0	\$52.88		
Attic	\$1,010.20	315 Gal Propane	1.0	\$998.99		
Air Sealing	\$0.00	38 Gal Propane	0.0	\$121.32		
Basement	\$1,348.85	74 Gal Propane	5.7	\$235.06		
Program Delivery/Audit Fee	\$0.00	N/A	N/A	N/A		
Customer Co-Pay Pre-Payment	- \$100.00	N/A	N/A	N/A		

By implementing the above recommended improvements, you are estimated to save annually;

351 kWh of Electricity

428 Gallon of Propane

5649.5 lbs of CO2 Emissions***

This package of improvements is estimated to save you \$1,418.06 on your energy bills and pay for itself in 1.7 years.

WHAT WE'RE DOING NOW

*** SOLARIZE KEARSARGE** Offer tax credits, rebates and volume-based discounts on residential rooftop solar * LED BUILDING UPGRADES **Obtain Smart Start funding for total LED** retrofits, beginning at Tracy Library * MUNICIPAL SOLAR ARRAY 220 kilowatts of solar panels will generate 40% of municipal electricity needs



30% Federal Tax Credit – this year only \$1000 New Hampshire state rebate Generous net metering rules Special discount from Granite State Solar Low-cost financing available Sign up for a free site visit

It's time for Solarize Kearsarge

For more information visit: www.granitestatesolar.com

The Solarize Kearsarge campaign offers group-purchase discounts on Solar PV for homes and businesses located in Andover, Newbury, New London, Warner, Wilmot and Sutton. This community discount is a limited time offer. The more participants we have, the higher the discounts for all. We are proud to announce that Granite State Solar is Vital Communities preferred solar installer for this campaign.

The Solarize Kearsarge campaign officially kicks off in April with installation to be done May through October 2019, but why wait?

Get ahead and schedule a site visit today. And don't worry, if you're one of our first few installations, you will receive the maximum grouppurchase discount as everyone else.

Call and schedule your visit today: 603.369.4318



A few of the 60+ residential solar installations in Andover

Let the Sun Provide Electricity for Your Home - and Save Money!

Find out more at Solar Saturdays in Andover, New London & Wilmot

Andover: May 4, 10am-2pm, Town Office Building New London: May 11, 10am-1pm, Tracy Library Wilmot: May 18, 10am-noon, WCA Red Barn

> Meet with solar experts Sign up for a free site visit Visit solar homes in the neighborhood

New London Municipal Solar Project



Ground-mounted solar array

- * 1 acre of land
- * 5 rows of panels
- * 428 panels total
- * 150 kilowatts DC
- * Land is vacant, cleared, and has 3-phase power on site



Rooftop solar array

- * Large southeast facing roof
- * Minimal tree clearing needed
- * 203 solar panels* 71 kilowatts DC



FUTURE PLANS

- * Outreach to residents, businesses and institutions: Hospital, Kearsarge Schools, Colby-Sawyer College
- * More energy efficiency upgrades
- * Additional municipal solar arrays
- * Heating: Convert to wood, electric or geothermal
- * Transportation: Upgrade town vehicle fleet, encourage electric vehicles & charging stations, expand public transit, add more park-and-ride lots, sidewalks & bike paths
- * Begin work on new Master Plan

LESSONS LEARNED

- * Master Plans are excellent guiding documents but should be updated more often than every 8-10 years.
- * Town Meeting voters have a strong appetite for EE (energy efficiency). In 2019 many voters wanted to double the EE capital reserve fund to \$60,000.
- * Energy Committees can be more proactive in promoting projects that in addition to saving energy, save taxpayers money (or are revenue-neutral).
- * We can serve as a model for neighboring towns. This year, the Town of Sunapee has just created an Energy Committee, and Sutton will be doing the same.

LET'S SAVE ENERGY & SAVE MONEY TOGETHER!

Measuring Municipal Carbon and Nitrogen Footprints



Jackson Kaspari, UNH Sustainability Fellow Alumni City of Dover, NH Planning Department

Project Goals

- Completed EPA Portfolio Manager profile for City and School facilities
- **Baseline carbon and nitrogen footprint calculations** for the City of Dover's municipal operations via Portfolio Manager and the SIMAP tool
- **Reports**, including recommended goals, to be presented to City leaders, staff and the general public
- Recommendations for adaptations to SIMAP methodologies and the user interface to allow a version that can support municipal calculations while being aligned with the Greenhouse Gas Protocols best practices for LGOs

Introduction

As a result of this project, Dover is the first city to establish a combined GHG and nitrogen inventory for its local government operations (LGO)

- **Carbon Footprint:** Total amount of greenhouse gases (GHGs) produced to directly and indirectly support human activities.¹
- **Nitrogen Footprint:** The amount of reactive nitrogen released to the environment as a result of an organization's resource consumption.²
- **Footprint Baseline:** A selected time period to which future footprints are compared.³



The Nitrogen Dilemma

Benefit

• Use of synthetic fertilizer is necessary to sustain the Earth's growing human population





Drawbacks

• The release of excess reactive nitrogen negatively impacts environmental and human health



5 Major Steps and Baseline Benefits



LGO Baseline Benefits

- Leads to the identification of opportunities to improve energy efficiency
- Demonstrates climate change leadership
- Allows reduction targets to be set and executed in a cost effective manner

Methodology



Emission Scopes

Scope	Description
1	Emissions from sources that are directly owned or controlled by the organization. Example: Fossil fuel combustion
2	Indirect emissions such as those produced from the consumption of electricity
3	Emissions that are a consequence of the organization's operations. Example: Employee commuting or business travel

Emissions Sectors

Sectors	Scope 1 Direct	Scope 2 Indirect	Scope 3 Indirect
	Emissions	Emissions	Emissions
Stationary Fuels	X		
Municipal Fleet	X		
Fertilizer and Animals	X		
Wastewater	X		
Purchased Electricity		X	
Transmission & Distribution Losses			Х
Employee Commuting			Х
Employee Travel			Х
Solid Waste			Х
School Food			X
Paper			X

Weather

	2016	2017	% Change
HDD ⁵	5,976	6,147	3
CDD ⁵	685	623	-9
TDD	6,661	6,770	2



Cumulative Snow Fall (in) ⁶				
2016	2017			
54.1	70.1			

Total Carbon Footprints



Total Nitrogen Footprints



Contributions via Scope



Equivalencies

11,260 acres of fully developed forest were required to sequester Dover's 2017 LGO GHG emissions ⁷



11,260 acres of forest is equivalent to ~66% of Dover's total land area ⁸





The amount of nitrogen emitted by Dover's 2017 LGO equated to enough food to feed ~8,600 people for one year ⁹

8,600 people = ~28% of Dover's population ⁸



Street Lights to LED



Solar Reduction Scenarios



Reduction Scenario	Description
1	2017 GHG LGO Emissions Baseline
2	Solar for New Dover HS, Children's Museum and Indoor Pool
3	Scenario 2 + Solar at WWTP, Varney Brook, Ice Arena and Transportation Center (1 MW Array Cap)
4	Scenario 2 + Solar at WWTP, Varney Brook, Ice Arena and Transportation Center (Max)

Food Based Nitrogen Reduction Scenarios



Full Report

Titled: Greenhouse Gas and Nitrogen Inventory Report for Municipal and School Operations

Available Online at the Dover NH Planning Department's Web Page

http://www.dover.nh.gov/government/ city-operations/planning/





- 1. Time for Change. What is a carbon footprint definition. https://timeforchange.org/what-is-a-carbon-footprint-definition (accessed June 15, 2018)
- 2. Galloway, J. N.; Winiwarter, W.; Leip, A.; Leach, A. M.; Bleeker, A.; Erisman, J. W.; Nitrogen footprints: past, present and future. *Environ. Res. Lett.* **2014**, 9.
- 3. Fong, W. K.; Sotos, M.; Doust, M.; Schultz, S.; Marques, A.; Deng-Beck, C.; *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.*
- 4. Guarnieri, M.; Balmes, R. J.; Outdoor air pollution and asthma. *Lancet*. **2015**, 383.
- 5. Weatherdatadepot. https://www.weatherdatadepot.com/ (accessed August 1, 2018)
- 6. National Centers for Environmental Information. https://www.ncdc.noaa.gov/cdoweb/datasets/GHCND/stations/GHCND:US1NHST0019/detail (accessed July 23, 2018)
- 7. Greenhouse Gas Equivalencies Calculator. https://www.epa.gov/energy/greenhouse-gas-equivalenciescalculator. (accessed July 6, 2018)
- 8. Economic + Labor Market Information Bureau. https://www.nhes.nh.gov/elmi/products/cp/profileshtm/dover.htm (accessed July 31, 2018)
- 9. Galloway, J. N. Department of Environmental Sciences, University of Virginia, Charlottesville, VA. Personal communication, August 2018.

