TOWN OF BEDFORD

Climate Action Plan Progress Report

October 2019

BEDFORD 2020

CLIMATE SMART COMMUNITIES NEW YORK STATE

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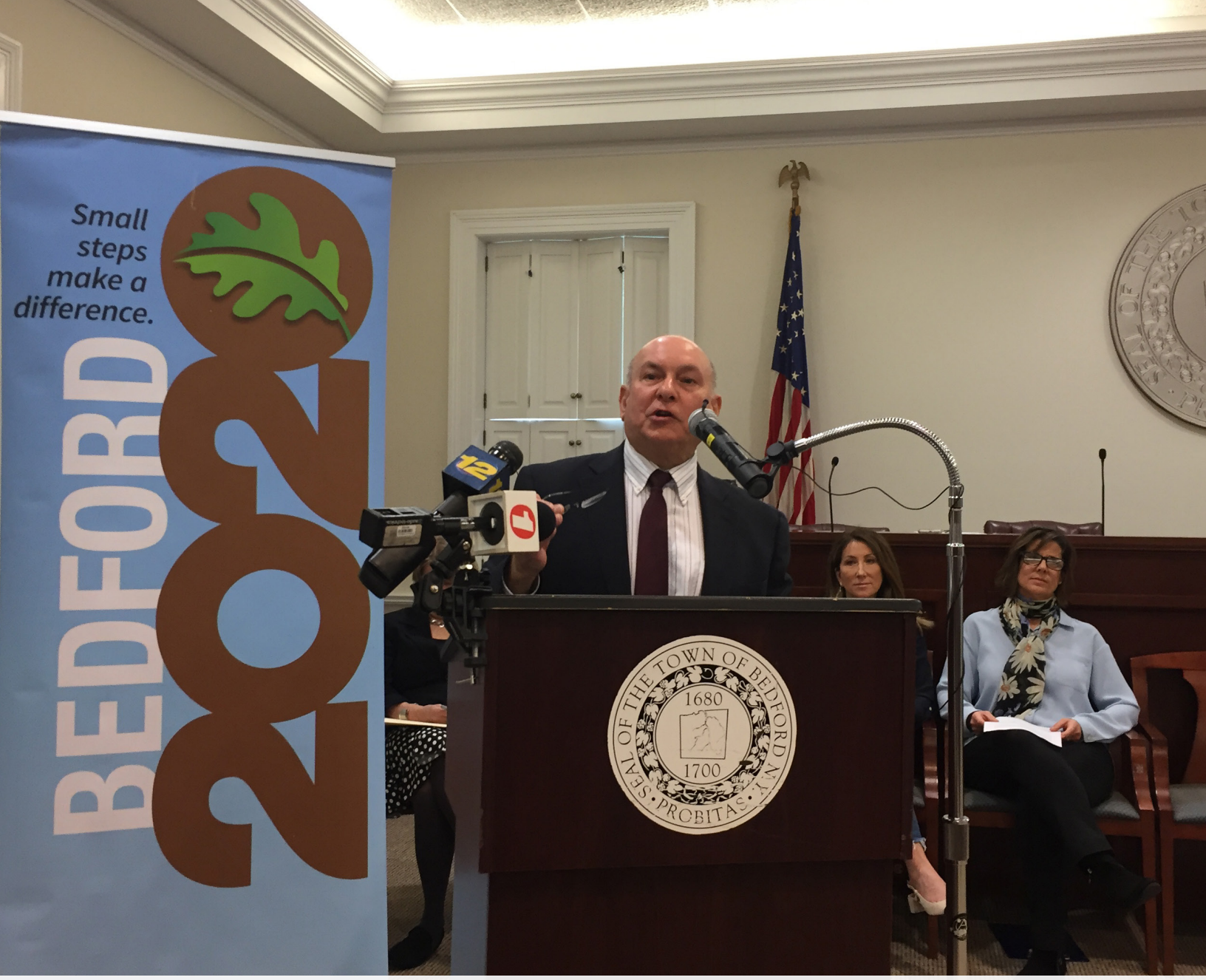
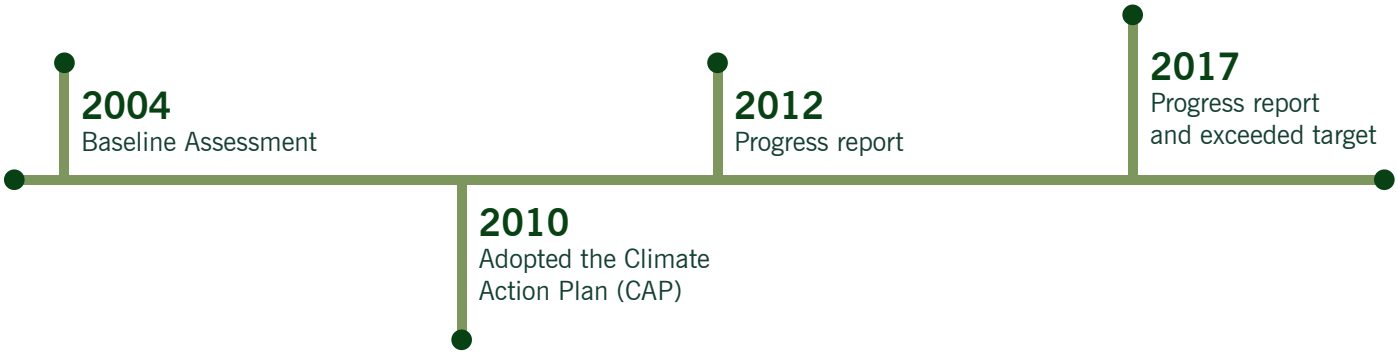


EXECUTIVE SUMMARY

We are pleased to report that based on an inventory of greenhouse gas emissions through 2017, the Town of Bedford has recorded a 44% reduction in community wide greenhouse gas reductions, more than doubling its 2020 goal and three years ahead of schedule. The Town has also exceeded its municipal operations goal, seeing a 22% reduction in emissions. This has been accomplished through public-private partnership between the Town of Bedford and Bedford 2020, the local non-profit formed to lead the community in achieving its climate action goals. The entire Bedford community has participated in efforts to reduce greenhouse gas emissions over the past 10+ years including municipal government, residents, local businesses, schools, civic and religious entities. All should be commended for this progress.



Background

The Town of Bedford adopted a Climate Action Plan (CAP) in 2010 that set an aggressive greenhouse gas reduction goal of 20% by 2020 for local government operations (Municipal operations) and the community as a whole. Implementation of the plan has been a community wide effort. The Town of Bedford has been a leader in Westchester County and in New York State, receiving grants, recognition, and awards for its Climate Action efforts.

This report describes Bedford's progress in meeting its climate action goals and highlights areas of success within each of its four action areas: Energy, Transportation, Waste & Recycling, and Water & Land Use. This report contains updated local greenhouse gas emission numbers from 2012 (the year the first Bedford progress report was completed) as well as 2017, as they compare to the original baseline year of 2004.

Bedford's Progress

As of 2017, the Bedford community has reduced greenhouse gas emissions by 44% achieving reduction of 91,110 metric tons CO_2e. This reduction far exceeds the community wide reduction goal of 20% by 2020. Despite increased operations (the installation of a new water filtration plant) and population growth, the municipal sector has also exceeded its goal by achieving a 22% reduction in GHG emissions. It is important to note that the municipal sector is a subset of the overall community and accounts for less than two percent of total emissions. However, as elected/government leaders and models for the community, meeting this reduction target is an accomplishment worth celebrating as well.

How did we accomplish this?

Local Efforts

Bedford 2020 is leading a community wide effort to implement the actions recommended in the CAP.

This effort is having an impact: reducing GHG emissions and making the community a healthier, more resilient place to live, work and play. Bedford has made substantial

progress in carrying out the actions identified in the 2010 CAP. These accomplishments are the result of many individuals, businesses and organizations taking steps in their everyday lives and contributing to the overall goals set forth by the Town. As a result of efforts in each of the four action areas of: Energy, Transportation, Waste & Recycling and Water & Land, GHG emissions have dropped significantly since 2004; discussed below are highlights from each action area.

Energy

Between 2004 and 2017, municipal stationary energy use increased by 3,372 MMBtu, while community energy consumption declined by approximately 56,976 MMBtu.[1] It is important to note that since the last Progress Report in 2012 the Town of Bedford commenced operation of a new water filtration plant which is responsible for adding significant energy consumption to total municipal energy.

In May 2016 Bedford adopted a pivotal policy in the Town's efforts to increase renewable energy usage, decrease GHG emissions and provide reliable electricity to residents and business, by participating in the Community Choice Aggregation (CCA) program. At that time, fourteen Westchester County municipalities (including Bedford) agreed to have 100% of electricity needs sourced from renewable energy supplies – solar, wind, and hydropower – via the CCA program.

Transportation

Between 2004 and 2017 transportation energy usage has declined in both the community vehicles and municipal fleet, 24,492 MMBTu and 3,410 MMBTu respectively. Annual municipal consumption (in gallons) of gas (42%) and diesel (10%) have been significantly reduced, directly reducing GHG emissions and improving air quality.

Some of these reductions are attributable to the Town's commitment to improving the efficiency of the municipal vehicle fleet. The municipal vehicle fleet has declined since 2004 and the Town has replaced 9 gas or diesel vehicles with more fuel-efficient, electric or hybrid vehicles. Municipal GHG emissions from this source are down 23% due to the reductions in gas/diesel consumption and vehicle fleet improvements.

Waste

Improved waste data collection methods and reporting has allowed the Town to calculate GHG emissions based on data from local waste haulers. Since 2004, the Town's waste reduction efforts have resulted in an annual decrease in total waste of 51%, equaling 6,820 tons. In 2017, the recycling rate increased to 33.8% - an increase of 19% since 2012. The waste reduction and recycling efforts have reduced GHG emissions 12,720 $MTCO_2e$ annually.

This significant reduction is in large part attributable to the Town launching single stream recycling in 2014. Additionally, the Town launched a Community Compost program in the Summer of 2017. Residents can choose to dispose of organic waste

1 In the process of analyzing GHG reductions from the 2004 baseline year for this Progress Report, an error in calculation of residential heating oil emissions was identified. This error has been corrected and an adjusted 2004 baseline emissions total of 208,559 metric tons CO2e has been applied to the analysis.

(food waste) at the Town recycling center and have the option of paying a modest one-time fee for buckets for collecting and transporting food scraps. This pilot program resulted in the composting of 17,850 pounds of food waste (approximately 9 tons) by the end of 2017 in its first six months of operation.

Water & Land Use

Few of the Water & Land Use measures have directly quantifiable greenhouse gas reductions, but the Progress Report includes an outline of the progress and status of land and water related measures identified in the CAP.

The modified water rate structure implemented in 2013 has resulted in a decrease in water consumption of approximately 5%.

The Great Healthy Yard Pledge is a program that works to eliminate the use of pesticides or chemical fertilizers on yards in Bedford. Synthetic chemicals are harmful to human health and have the potential to leach into groundwater and impact drinking water sources. Bedford residents signed the Great Healthy Yard Pledge to protect over 4,400 acres in our Town (approximately 17% of the total area in Bedford).

The Bedford 2020 Food Forum (900 attendees) and resulting Meatless Mondays with Bedford 2020 (320 participating households) campaign educated the community about the correlation between food choice and carbon footprint.

State and Regional Context

In addition to specific steps taken in Bedford by our local government and the broader community, we have also benefited from state actions in the following ways:

Energy

Since Bedford's 2004 baseline year, New York State's grid electricity mix has changed to include more renewable energy. According to the New York State Energy Research and Development Authority's (NYSERDA) Biennial Report, *The Energy to Lead* published in 2017, New York State ranks eighth nationally in energy consumption, however uses the lowest amount of energy per person.[2]

New York State has adopted several energy policies to promote and expand the growth of energy efficiency and renewable energy resources such as wind power and solar energy. These policies are specifically aimed at promoting adoption of renewable technologies and development of renewable energy sources, including:

Clean Energy Fund — Is one of NYSERDA's three strategic pillars to deliver on New York State's commitment to reduce ratepayer collections, drive economic development, and accelerate the use of clean energy. This program pledged $5 billion dollars of funds over the next 10 years to innovation, research, and market development.

The Regional Greenhouse Gas Initiative (RGGI) — Is the first market-based regulatory program in the United States to reduce greenhouse gas emissions. RGGI is a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont to cap and reduce CO_2 emissions from the power sector.

Adopting a Clean Energy Standard — The Public Service Commission (PCS) issued the Order "Adopting a Clean Energy Standard" in August 2016 requiring all load-serving entities (utilities as well) to acquire an increasing amount of renewable electricity through the year 2030.

Renewable Portfolio Standard — Is a policy that seeks to increase the proportion of renewable electricity used by retail customers.

Renewable Energy Incentives — State government offers grants and loans to help New Yorkers adopt renewable energy technologies or develop renewable energy businesses.

NY-Sun Program — Grew solar capacity in New York by nearly 800 percent from 2011 to 2016. This program provides education, local government resources, and incentives to homes and business making solar energy more accessible across the State.

2 New York State Energy Research and Development Authority (NYSERDA) *The Energy to Lead.* Published 2017. https://energyplan.ny.gov/Plans/2015-Update.

Net Metering — The state's recently-adopted net metering law makes it easier for residences and businesses to use solar photovoltaic (PV) technology. Under net metering, homes, businesses, farms and institutions can feed excess electricity generated by renewable technologies such as photovoltaics, wind, biomass, fuel cells, anaerobic digestion, small hydroelectric and microturbines back into the electric power grid and receive credit from their power suppliers.

METHODOLOGY

This Progress Report builds off of the baseline assessment completed by ICLEI in 2004 using its Clean Air and Climate Protection (CACP) tool. VHB calculated greenhouse gas (GHG) emissions reductions for the 2012 and 2017 Progress Reports. Calculations for 2017 data were completed by GHG accounting professionals per accepted industry standard methods and assumptions used to track progress in quantifying GHG emissions. Data collection processes are consistent with methods used for the 2012 Progress Report. Data was provided by the Town of Bedford through various data sources (e.g., utility providers, waste haulers, and municipal departments). Where information could not be obtained it was calculated by VHB using assumptions and emission factors from accepted standard industry sources (e.g., the U.S. Environmental Protection Agency and U.S. Energy Information Administration).

It is important to note that measuring emissions on a community wide basis is not an exact science and requires making calculated assumptions as it is not possible to access 100% of activity data on a community wide basis (as is possible for a municipal or business inventory). It is also important to note that this analysis is an update to measure the progress since the Town of Bedford 2004 baseline inventory as well as the measures outlined in the 2004 Bedford Climate Action Plan (CAP) and is not a full GHG emissions inventory. By comparing the 2004 baseline and 2017 emissions, this report is an effective tool to track, report, and drive community action and planning. The 2017 Progress Report relied on resources and data from the following sources:

- The Town of Bedford;
- Utility Providers;
  - New York State Electric and Gas Corporation (NYSEG)
  - Con Edison (ConEd)
  - Westchester Power
- The Town of Bedford Waste Consultant;
- Westchester County Public Works;
- U.S. Environmental Protection Agency – 2016 eGRID Factors[3];
- U.S. Environmental Protection Agency – 2018 Emission Factors for Greenhouse Gas Inventories and Global Warming Potential factors[4]; and
- U.S. Department of Energy, Energy Information Administration

It should be noted that in the process of developing this progress update, an error was found in calculation of the 2004 baseline emissions data. The portion of emissions attributed to residential heating oil, and the total community emissions number has been adjusted accordingly. In addition, it was determined that the electricity emissions factors being used for municipal and community-scale electricity consumption should be adjusted. This update now uses two separate eGRID sub-region factors (based on utility source) that better reflect the grid profile of Bedford's electricity sources.

INTRODUCTION

This Progress Report outlines the current status of measures identified in the Town of Bedford's 2010 Climate Action Plan (CAP) as well as progress to date on key performance metrics. Progress to date is provided in summary tables throughout this report. Wherever possible, the energy and greenhouse gas reduction impacts have also been quantified and included in this report. Finally, this report also provides an update on the overall progress the Town has made in reaching its 20% reduction by 2020 goal.

Progress on Bedford's greenhouse gas reduction goal and CAP measures within this report consist of two parts: municipal and community emissions. As noted earlier, municipal greenhouse gas emissions are a subset of the overall community. Municipal emissions account for less than two percent (1.4%) of the overall community emissions.

In the years since the CAP was adopted, Bedford has reduced its community-wide GHG emissions by 91,110 $MTCO_2e$, or a reduction of 44% from its baseline, far surpassing its 20% reduction goal – ahead of schedule. The Town has also surpassed its municipal operations reduction goal, achieving a 22% emissions reduction. Since the last Progress Report (in 2012), the Town of Bedford started operating a new water filtration plant which is responsible for adding additional energy consumption to the total municipal energy consumption. This means that while efficiencies were gained in many municipal operations, the water filtration plant, important for serving the needs of the town, contributed to what would otherwise have been an even greater reduction.

The Town of Bedford can be proud of its climate efforts to date having more than doubled the overall community-scale target set forth in the CAP. The following sections of this Progress Report provide more detail on how Bedford has accomplished its greenhouse gas reductions in each of the four areas identified in its CAP. Those focus areas include:

Energy

Waste and Recycling

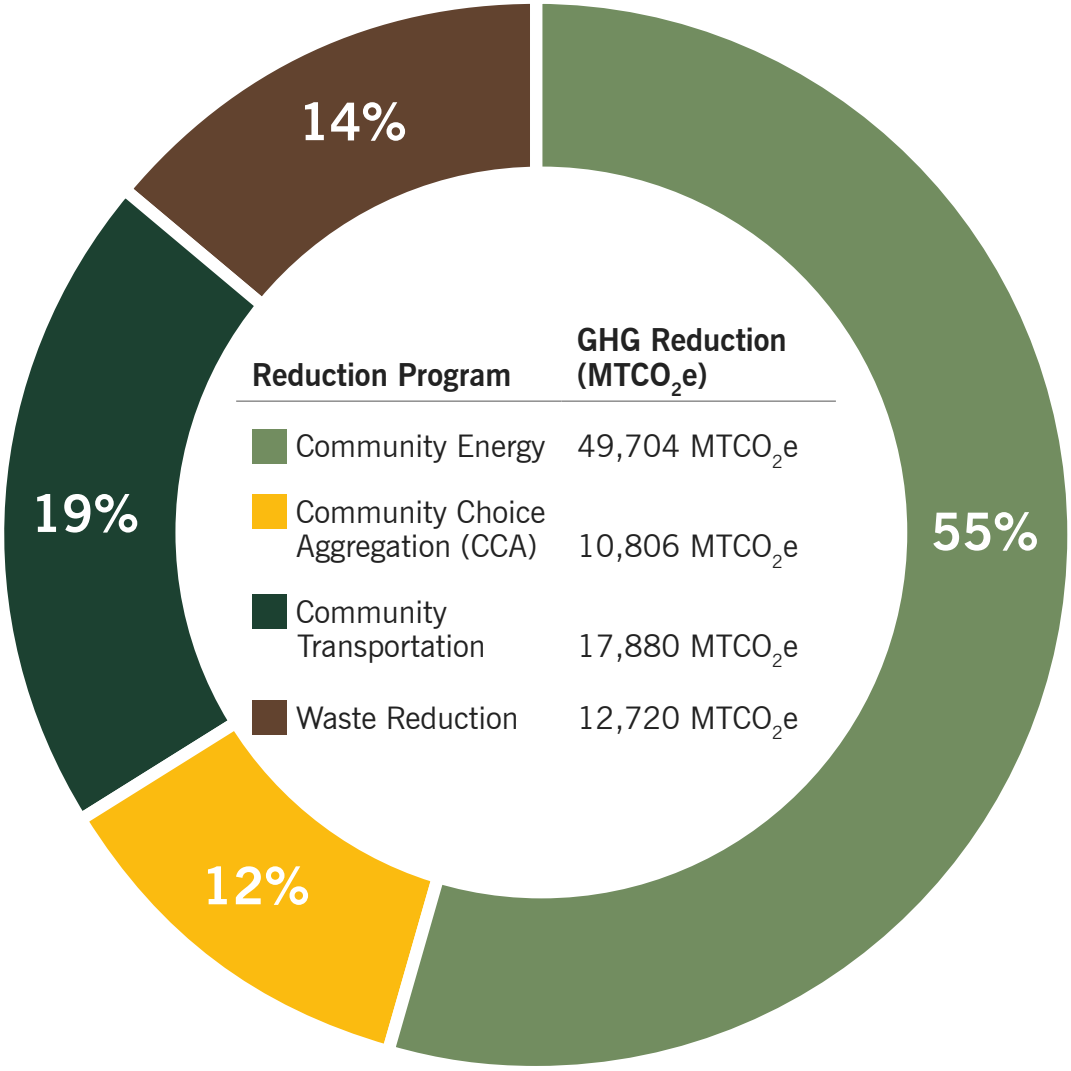
Transportation

Land and Water Use

Table 1 Overall Greenhouse Gas Reductions

2004 Baseline ($MTCO_2e$)	2020 Goal ($MTCO_2e$)	2017 Emissions ($MTCO_2e$)	Reduction as of 2017 ($MTCO_2e$)	% of GHG Reductions
MUNICIPAL				
2,185	1,847	1,702	483	22%
COMMUNITY				
208,559	166,847	117,449	91,110	44%

Community GHG Reductions by Sector or Program



CCA is inclusive of Westchester Power and other alternative energy service providers.

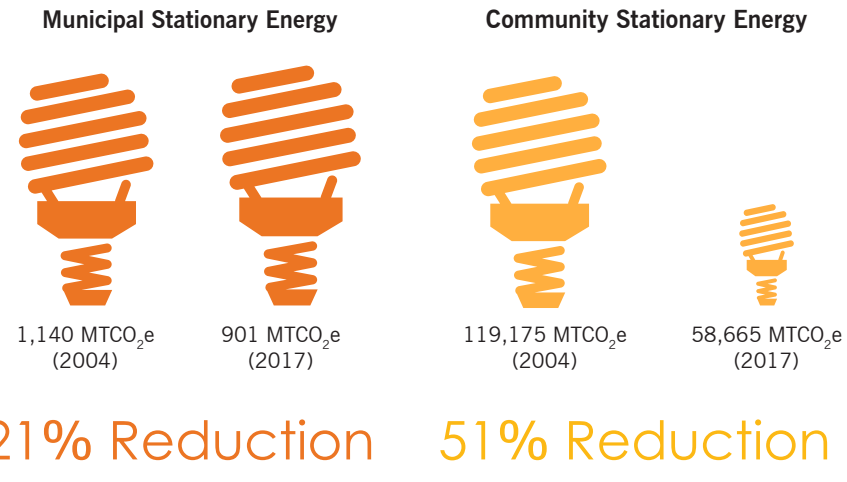
ENERGY

In its Climate Action Plan (CAP), the Town of Bedford identified several measures that would improve energy efficiency and promote renewable energy within municipal operations as well as throughout the Bedford community. The Plan identified 9 municipal measures and 15 community measures[5] that had the potential for achieving significant reductions in energy throughout Bedford. With a growing population to serve and development of new municipal facilities, most notably the new Water Filtration Plant (opened in 2013), municipal operations saw an increase in stationary energy use in the last five years.[6]

Although municipal stationary energy consumption has increased since the baseline year of 2004, efforts to date have contributed significantly to keeping the municipal GHG emissions well below the projected 2020 emissions values. Other factors also contributed to the increase in municipal stationary energy numbers, including increased data resolution and reporting. In 2012, fewer municipal outdoor lighting, street and traffic lights energy consumption totals were reported and included in the 2012 municipal energy calculations. The 2012 municipal energy numbers for outdoor lighting, street and traffic lights were amended in this report.

Efforts to improve efficiency and increase the use of renewable energy community-wide have paid off. Approximately 18 percent of the community energy consumed is sourced from renewable energy sources, primarily as a result of the success of the Westchester Power Community Choice Aggregation program.

GHG Emissions



5 The CAP contains more measures, but where progress can be tracked similarly, measures have been combined/synthesized.

6 The operations of this facility were not captured in the 2012 Progress Report

The Town has been working diligently to implement and track the municipal energy measures outlined in the CAP. These policies and initiatives include identifying equipment where improvements or retrofitting is applicable, and the installation of renewable energy systems. While there is some overlap between municipal and community measures, the CAP outlined Community energy measures which include education and outreach focused on energy efficiency, financing opportunities for audits and retrofits, and policy changes to promote renewable installations. The ripple effect from reducing energy consumption and increasing renewable energy provides a vast number of co-benefits such as economic development, improved quality of life, a more resilient energy system, and GHG emissions reductions.

Community Choice Aggregation Program

In May 2016 Bedford adopted Community Choice Aggregation (CCA). This program gives consumers the power of choice in deciding their energy sources, makes renewable energy more accessible, and provides potential cost-savings through fixed and stable rates. Adoption of CCA was a pivotal achievement in the Town's efforts to increase renewable energy usage, decrease GHG emissions and provide reliable electricity to residents and businesses. At that time fourteen municipalities (including Bedford) opted to have 100% of electricity needs come from renewable energy supplies – solar, wind, and hydro, no fossil fuel or nuclear energy. In its first year (2016-2017) the program reduced GHG emissions by 10,806 $MTCO_2e$.[7]

7 Inclusive of Westchester Power and other alternative energy service providers.

The Town of Bedford is in the process of converting all existing utility pole mounted streetlights to light-emitting diode (LED) fixtures. This project will convert all 571 existing streetlights to LED, improving the quality of street lighting, reducing the Town's carbon footprint, and annual electricity costs. The Town intends to complete the majority of this project between 2018 and 2019.

Over 212 homes in Bedford have completed energy efficiency upgrades and are thereby reducing greenhouse gas emissions though the Energize Bedford program.

In 2015, Bedford 2020 celebrated its five-year anniversary by hosting the Environmental Summit and Solar Action Day. Over 550 people gathered to learn about renewable energy cost savings, Bedford 2020 programs, New York State policies and programs, and how GHG emissions are created from energy production and usage. Attendees of this event included businesses, civic organizations, community leaders, various media outlets and subject matter experts.

As a result of the Environmental Summit and Solar Action Day the Solarize Bedford-Mt. Kisco program was launched. The 18-week effort provided education and resources for residents interested in installing clean solar energy. This program received over 300 inquiries and drove a 43% increase in residential solar installations. Solar energy usage displaced over 20 $MTCO_2e$ in 2017.

In 2015, the Commercial Solarize event hosted over 30 businesses and referred between 5 and 10 commercial buildings to the Energize Bedford program.

Table 3 outlines the status and progress of these measures along with a recommended metric for tracking progress on each measure, and the co-benefits associated with each.

Table 3 Energy Measures, Status, Progress and Benefits

Measure	Status	Recommended metric	Progress	Co-Benefits
MUNICIPAL ENERGY MEASURES				
Renewable energy purchasing	In Progress	% electricity purchased from renewable sources	25 % electricity from wind	
Energy efficiency retrofits in town facilities	In Progress	MMBTu, Energy Cost, CO_2 reduction	NA	
Municipal green building policy	In Progress	# buildings built to green standards	Under consider-ation; 1 building built to LEED Silver standards	
Municipal green purchasing policy	In Progress	# of buildings built to green standards	Under consider-ation; 1 building built to LEED Silver standards	
Municipal green purchasing policy	Implemented	% of purchases meeting energy efficiency standards	Adopted	
Energy efficiency/ENERGY STAR appliances *(computers, printers, refrigerators, vending machines, water coolers, copiers)*	Implemented	% of appliances and other equipment that are Energy Star	When making improvements to municipal facilities the Town works to update appliances wherever feasible.	
Efficiency lighting retrofits	In Progress	% of lighting upgraded; Electricity savings	When making improvements to municipal facilities the Town works to upgrade to more efficient lighting options.	
Lighting occupancy sensors	In Progress	% of space using sensors; electricity savings	When applicable the Town works to place lightning occupancy sensors.	
Use solar PV energy	Implemented	Capacity installed, kWh solar electricity generated; % of fossil fuel-based energy displaced	50 kW system installed; estimated to generate approx 40,000 kWh per year	
Consider solar hot water systems for town owned buildings	Not Started	Energy, cost, emissions savings; # of systems	NA	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Table 3 Energy Measures, Status, and Progress [continued]

Measure	Status	Recommended metric	Progress	Co-Benefits
COMMUNITY ENERGY MEASURES				
Residential energy efficiency retrofits	Implemented	# of homes participating	212 homes have completed energy efficiency retrofits.	
Community scale renewable energy	In Progress	MW installed, by renewable type (e.g. solar, wind, geothermal, other); total renewable energy purchased	Since 2012, 13 different renewable energy sources have been purchased, built, or leased producing 215,823 kWh annually of renewable energy.	
Energy efficiency retrofits of existing commercial facilities	Not Started	Number of facilities implementing retrofits	NA	
Energy efficiency education for businesses	In Progress	# of educational programs held; # of businesses participating	2015 *Solarize* event had 30 businesses in attendance and referred 10 commercial buildings to the *Energize* Bedford program.	
Require home energy rating (HERs) at time of sale	Not Started	Number of homes sold since adoption (compliance %)	NA	
Promote existing home weatherization programs for low income households and seniors	Not Started	Number of homes weatherized	NA	
Bedford residential building energy code	Implemented	Updated code passed; Number of homes built	In the Town of Bedford, there were 42 single family homes, 2 2-family homes, and 2 multi-family homes built -- all to compliance - between 2013-2017	
Bedford commercial building energy code	Not Started	# buildings (% compliance)	NA	
Energy efficient multi-family housing	Not Started	# new units (% of units in compliance)	NA	
Residential construction feebate program	Not Started	# new buildings meeting standard (receiving rebate) versus # new buildings charged fee	NA	
Ordinance review for renewable energy installation	Implemented	Completion of review and document summarizing findings and recommendations	Yes	

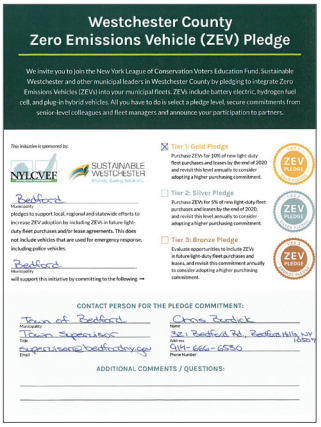
Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Table 3 Energy Measures, Status, and Progress [continued]

Measure	Status	Recommended metric	Progress	Co-Benefits
Accelerate permitting process for green buildings	Not Started	# of accelerated permits processed (and average time)	NA	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

TRANSPORTATION


Westchester County
Zero Emissions Vehicle (ZEV) Pledge

We invite you to join the New York League of Conservation Voters Education Fund, Sustainable Westchester and other municipal leaders in Westchester County by pledging to integrate Zero Emissions Vehicles (ZEVs) into your municipal fleets. ZEVs include battery electric, hydrogen fuel cell, and plug-in hybrid vehicles. All you have to do is select a pledge level, secure commitments from senior-level colleagues and fleet managers and announce your participation to partners.

This initiative is sponsored by:

NYLCVEF

SUSTAINABLE WESTCHESTER

Bedford
(Municipality)
pledges to support local, regional and statewide efforts to increase ZEV adoption by including ZEVs in future light-duty fleet purchases and/or lease agreements. This does not include vehicles that are used for emergency response, including police vehicles.

Bedford
(Administrator)
will support this initiative by committing to the following ➙

☒ Tier 1: Gold Pledge
Purchase ZEVs for 10% of new light-duty fleet purchases and leases by the end of 2020 and revisit this level annually to consider adopting a higher purchasing commitment.

☐ Tier 2: Silver Pledge
Purchase ZEVs for 5% of new light-duty fleet purchases and leases by the end of 2020, and revisit this level annually to consider adopting a higher purchasing commitment.

☐ Tier 3: Bronze Pledge
Evaluate opportunities to include ZEVs in future light-duty fleet purchases and leases, and revisit this commitment annually to consider adopting a higher purchasing commitment.

CONTACT PERSON FOR THE PLEDGE COMMITMENT:

Town of Bedford
(Municipality)
Town Supervisor
(Title)
supervisor@bedfordny.gov
(Email)

Chris Burdick
(Name)
321 Bedford Rd., Bedford Hills, NY 10507
(Address)
914-666-6550
(Phone Number)

ADDITIONAL COMMENTS / QUESTIONS:

In its Climate Action Plan (CAP), the town of Bedford identified a number of measures aimed at reducing greenhouse gas emissions in the transportation sector. Overall, a total of 31 measures (9-municipally focused; 22-community focused) have been identified to help achieve the Town's total greenhouse gas reduction goal.

The Town has acknowledged that transportation-related measures can be some of the most challenging measures and policies to implement because they necessitate three things: changes to infrastructure; changes in policy; and changes in individual behavior. Measures identified in the CAP include replacing the municipal fleet with more energy-efficient vehicles, upgrading Town infrastructure, and incorporating and promoting sustainable transportation. Municipal vehicle gas and diesel consumption has dropped significantly since 2004. Gas consumption by municipal departments has decreased 42 percent, and diesel consumption decreased 10 percent. Reductions in municipal $MTCO_2e$ and MMBTu are summarized in **Table 4.** The Town has implemented a number of key foundational efforts that will help further reduce transportation-related emissions.

GHG Emissions

Municipal Vehicle Fleet

1,045 $MTCO_2e$
(2004)

801 $MTCO_2e$
(2017)

↓ 23%
in Municipal Vehicle Fleet

Community-wide Transport

74,693 $MTCO_2e$
(2004)

56,813 $MTCO_2e$
(2017)

↓ 24%
in Community-wide Transport

Table 4 Summary of Municipal Vehicular Energy Usage from 2004, 2012, and 2017

2004		2012		2017	
Total Energy (MMBTu)	Total CO_2e	Total Energy (MMBTu)	Total CO_2e	Total Energy (MMBTu)	Total CO_2e
VEHICLE FUEL					
14,349	1,045	9,926	722	10,939	801

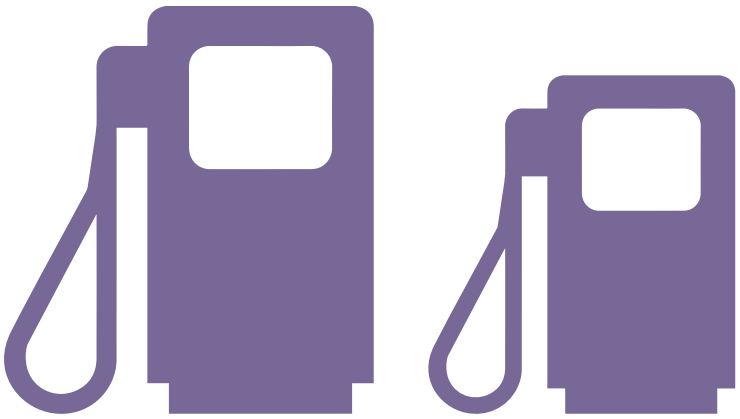
Municipal Gas and Diesel Consumption (Gallons)

↓ 42%

Municipal Vehicle Gas Consumption (Gallons)

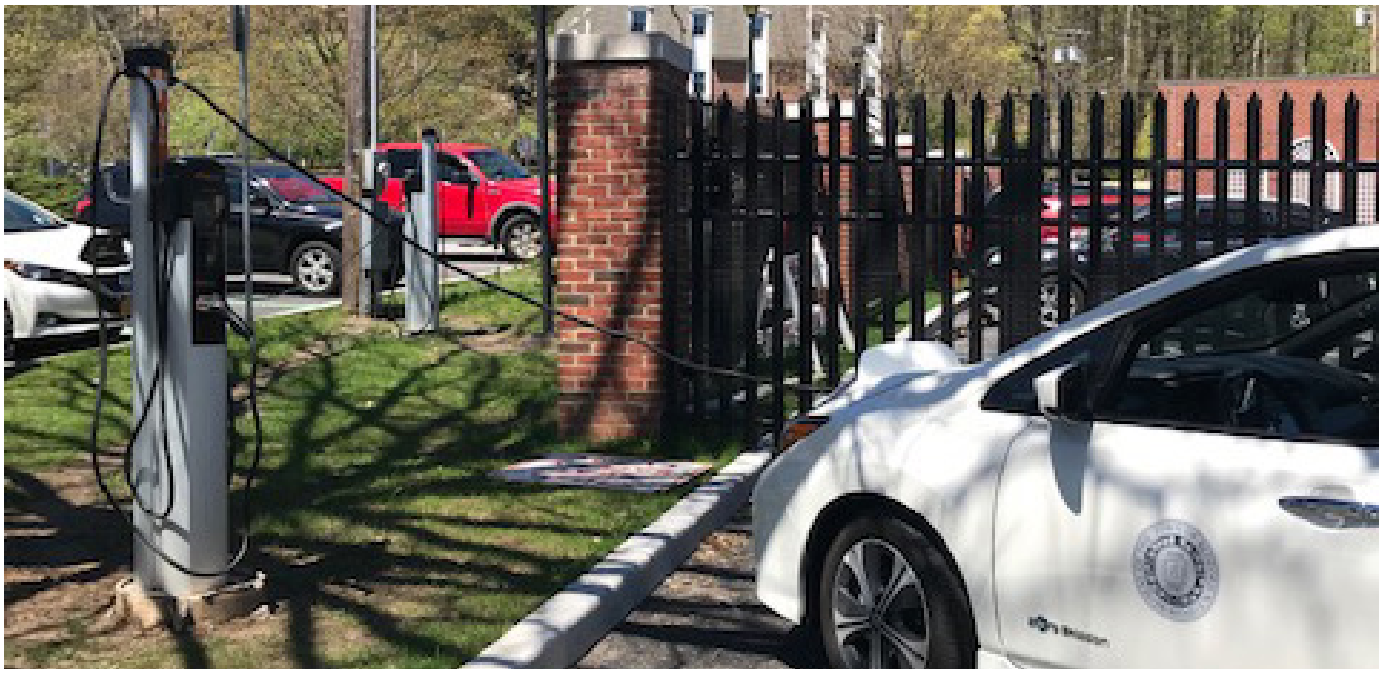
↓ 10%

Municipal Vehicle Diesel Consumption (Gallons)



Gas 49,718
Diesel 58,943
(2004)

Gas 29,057
Diesel 52,951
(2017)



The Town of Bedford has made great strides in reducing the consumption of gasoline by municipal departments and offices, resulting in a reduction in total energy (MMBTu) and $MTCO_2$. The efforts have lowered the emissions of the Bedford municipal vehicle fleet by 244 $MTCO_2$ (since the 2004 baseline) and a reduction in overall energy of 23 percent. See Table 4 for a summary of this municipal Vehicle Energy Usage.

The Town of Bedford continues to work with municipal departments (e.g., Highway, Police, Parks and Recreation) to reduce the municipal vehicle fleet, and where applicable replace existing gas or diesel vehicles with electric or hybrid vehicles. The municipal vehicle fleet has declined since 2012 and the Town replaced 9 gas or diesel vehicles with electric or hybrid vehicles.

The Bedford 2020 Car Show hosted in 2013 was a great success in building awareness around the many benefits of EV's and fuel-efficient driving. It was the State of New York's first-ever fuel-efficient car show. Over 1,100 people attended to learn about electric vehicles, charging stations, hybrid vehicles, and solar power.

A ride-share program was instituted in 2017 to promote ride-sharing or car pooling to major Bedford 2020 community engagement events.

Over 6 miles of multi-use paths have been installed in Bedford, promoting healthy commute options like walking or biking and active recreation. Increasing the multi-use paths and sidewalks can help reduce vehicle emissions.

Table 5 outlines the status and progress of these measures along with a recommended metric for tracking progress on each measure, and the co-benefits associated with each.

Table 5 Energy Measures, Status, Progress and Benefits

Actions listed in the CAP	Status	Metric/Indicator	Progress	Co-Benefits
MUNICIPAL TRANSPORTATION MEASURES				
Use smaller fleet vehicles	In Progress	# of vehicles replaced with smaller vehicles	9 vehicles replaced with smaller, more fuel-efficient vehicles	
Electric vehicles	In Progress	# of EV in fleet; # EV charging stations	Replaced 2 vehicles with EVs, and added 8 EV charging stations	
Hybrid vehicles in municipal fleet	In Progress	# of hybrid vehicles in fleet	Replaced 7 vehicles with hybrids	
Fleet conversion to biodiesel (B20)	Not Started	Gallons (annual) switched from diesel to biodiesel	NA	
Compressed natural gas (CNG) vehicles	Not Started	# CNG vehicles; added CNG fueling infrastructure	NA	
Increase rail transit ridership	Not Started	Percent of Town employees using rail transit	NA	
Promote use of public transportation, carpooling, and vanpooling	Not Started	Percent of Town employees using transit, car/vanpooling (biking/walking); Financial incentives for alternative commute to employees	NA	
Enforce Westchester County's anti-idling law for town owned trucks	Not Started	NA	NA	
Police on bicycles	Not Started	# of police on bicycles (replaced car)	4 bicycles	
COMMUNITY TRANSPORTATION MEASURES				
Use smaller fleet vehicles	Not Started	# of corporate fleets that have replaced vehicles with smaller, more efficient, and/or alternative fuel vehicles	NA	
Increase ownership of hybrid vehicles or electric vehicles	Implemented	NA	Town offers $50 parking incentive at both commuter lots	
Fleet conversion to biodiesel (B20)	Not Started	# of fueling facilities providing biodiesel	NA	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Table 5 Energy Measures, Status, Progress and Benefits [continued]

Actions listed in the CAP	Status	Metric/Indicator	Progress	Co-Benefits
Education of low-carbon transportation options	In Progress	# of outreach events. Potential the increase in public transit ridership	Had EV exhibitors at 2015 Solar Summit and 2018 Climate Action Summit. Had a rideshare option at 2017 Food Forum and 2018 Climate Action Summit.	
Electric vehicle charging stations in parking structures and other locations	In Progress	# charging stations	8 charging stations installed throughout the Town	
Compressed natural gas vehicles	Not Started	# of CNG vehicles	NA	
Promote use of public transportation, carpooling, and vanpooling	In Progress	Ridership #s	Hosted several exhibitors at public outreach events that promote the use of public transportation or ridesharing.	
Initiate a carshare	Not Started	# carshare participants	NA	
Enforce Westchester County's anti-idling law	In Progress	NA	NA	
Increase bike and pedestrian infrastructure, create bicycle friendly zones	In Progress	Miles of bike/pedestrian trails/ paths	6 miles of multi-use paths maintained at Bedford Center	
Integrate bicycle and transit	Not Started	Bike "parking spaces" near transit	NA	
Create pedestrian friendly zones and increase hamlet sidewalks	In Progress	Length of new paths or sidewalks installed	Installed 2,000 feet of new sidewalk on Valley Road.	
Provide bicycles for daily trips	Not Started	# bike available through bike share	NA	
Safe routes to schools	Implemented	Adopting new policies	Yes	
Retrofit school buses with oxidation catalysts	Not Started	# of buses retrofitted	NA	
School bus emissions controls- particulate trap	Not Started	# of buses retrofitted	NA	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

WASTE & RECYCLING

In its Climate Action Plan (CAP), the Town of Bedford identified 21 measures that would reduce emissions from the waste sector in municipal operations as well as throughout the community. The Plan identified six municipal measures and 15 community measures[8] that aimed to reduce waste generation, increase recycling, and divert waste from landfills. Equally important, these measures provide for additional co-benefits such as job creation, cost savings, improved health, and improved awareness of municipal environmental programs.

Increasing recycling efforts and reducing the amount (in tons) of waste sent to landfills or waste facilities, can have a direct impact on reducing GHG emissions ($MTCO_2e$). Reducing the amount of waste sent to landfills or waste facilities, can also decrease the amount of energy used at waste facilities and methane released from decomposing materials. Recycling aids in reducing GHG emissions by decreasing the amount of materials processed and transported to landfills or waste facilities, as wells as reducing the energy needed to extract raw materials. Annual GHG emissions reductions were calculated using the EPA WARM Model[9] reduction factors and data obtained from waste haulers (tons of material).

The waste and recycling measures identified in the CAP included policies to reduce municipally generated waste, increase recycling among residents and businesses, provide public outreach and education, and improve and expand composting initiatives. Community measures included enacting single stream recycling, education and outreach to community members and businesses, improved access to composting facilities, and financial incentives and disincentives to encourage recycling and composting. The implementation of waste reduction initiatives has paid dividends by increasing the diversion rate to 60%. The diversion rate is the amount of materials diverted to recycling, compost, or reuse that would traditionally go to landfills or incinerators. Material diverted by the Town's waste programs include, yard and food waste, traditionally recycled items, and consumer items like clothing and electronics. The waste and recycling efforts resulted in an average annual reduction of 12,720 $MTCO_2e$. These programs have contributed to the substantial decrease in the total amount of waste sent to landfills or waste facilities, a reduction of 51%. The Town has been proactive in implementing several of these measures and is in the process of implementing and refining several others towards achieving our aspirational goal of Zero Waste by 2020.

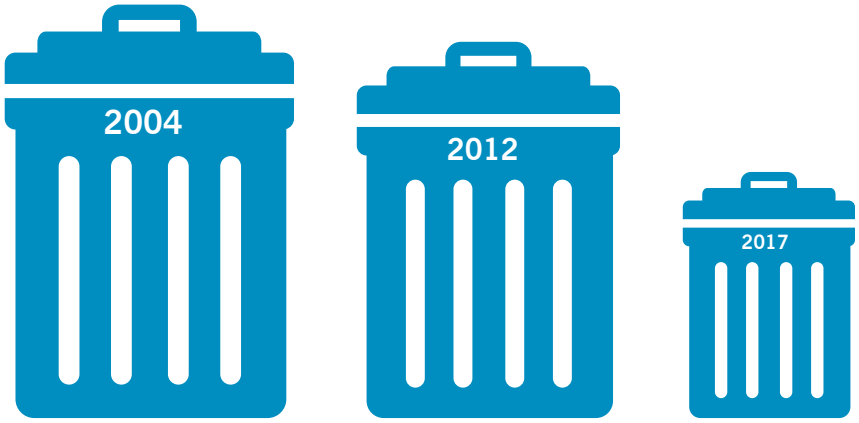
8 The CAP contains more measures, but where progress can be tracked similarly, measures have been combined/synthesized.

9 U.S. EPA – Waste Reduction Model (WARM). https://www.epa.gov/warm

Community Waste

51% Reduction

in Waste from 2004 to 2017



13,300 Tons | 10,080 Tons | 6,480 Tons

Community Composting Initiatives

Bedford 2020 and the Town launched the Community Compost program in the Summer of 2017. Town of Bedford residents can choose to dispose of organic waste (food waste) at the Town Recycling Center, over 100 households participated in 2017. This program resulted in the composting of 17,850 pounds of food waste (approximately 9 tons) by the end of 2017 in its first six months.

In 2017 residents participated in the yard waste recycling. Approximately 12,712 cubic yards of organic materials were diverted from landfills as a result of this program. Organic materials collected include wood waste (logs and branches up to 6" diameter, brush, and leaves). Residents who contributed to the compost facility were able to receive wood mulch and leaf compost for participating in the program.

Single-stream recycling has continued to increase the Town's ability to reduce waste sent to its waste facility. In 2017 the recycling rate increased to 33.8% - an increase of 19% since 2013.

The Town continued initiatives to collect other recyclables including clothing and E-waste, these programs diverted waste from the waste stream and removed potentially hazardous materials from landfills. In 2017, over 16,203 pounds of clothing was recycled and over 35,455 pounds of electronic equipment was collected.

Over 80 recycling receptacles were added to public areas to increase the accessibility to residents that are using these spaces and reduce the waste generation at public areas.

Table 6 highlights the progress that has been achieved with regard to waste reduction and associated GHG emissions reductions.

Table 6 Greenhouse Gas Reductions as a result of Waste Measures

GHG Reductions from implemented Waste Measures				
TOTAL WASTE				
2004 Baseline Waste (tons)	2012 Waste (tons)	2017 Waste (tons)	Waste Reduction (tons)	GHG Reduction ($MTCO_2e$)
13,300	10,080	6,480	6,820	12,720

Table 7 outlines the status and progress of these measures along with a recommended metric for tracking progress on each measure, and the co-benefits associated with each.

Table 7 Waste Reduction Measures, Status, Progress and Benefits

Measure	Status	Recommended Metric	Progress	Co-Benefits
MUNICIPAL WASTE & RECYCLING MEASURES				
Zero waste goal for public events	In Progress	Tons waste generated at public events	Town requires that event organizers include a recycling plan in applications for Town approval of events	
Municipal green procurement and recycling policy	Implemented	Amount of material recycled	Adopted Green Purchasing Policy - life cycle energy costs, materials/ingredient sustainability, recyclability, transportation and packaging costs; Testing use of green cleaning products	
Composting bins at town parks	Not Started	Number of composting bins, weight of compostable material picked up	NA	
Expand and enhance existing municipal composting	In Progress	Weight of compostable material	**Yard Waste:** 12,712 cubic yards **Organic Food Waste:** 17,850 pounds	
Reuse/recycling of construction materials	Implemented	Quantity of material reused	113.44 tons of C&D waste, 4.21 tons of metal	
Low-VOC procurement policy for cleaning products and paint	Not Started	NA	NA	
COMMUNITY WASTE & RECYCLING MEASURES				
Bedford waste and recycling study	Implemented	Study completed	Yes	
Develop reporting requirements for carters	Completed	NA	Created reporting requirements for waste haulers - destination, tonnage, composition	
Establish/expand curbside recycling programs and increase plastic recycling eligibility	Implementing	GHG, Total amount of material recycled by type and weight	**Single Stream recycling:** 3,020 tons	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Table 7 Waste/Recycling Measures, Status, and Progress [continued]

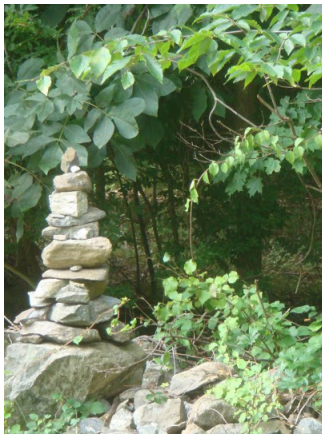
Measure	Status	Recommended Metric	Progress	Co-Benefits
Waste and recycling education campaign	Implementing	# of materials created and distributed	On-going e-news (B2020 and Town), flyers, website (B2020 and Town) information on recycling. Community education events. B2020 also acts a resource to residents with recycling questions	
Implement pay-as-you-throw program	Completed	NA	Waste carters now offer the Pay-as-you throw option to Bedford Residents.	
Reuse facilities/programs	Not Started	GHG, amount of material diverted (by weight or number)	NA	
Establish/expand business recycling programs	Not Started	Increased in recyclable material picked up (tons)	NA	
Organics composting facility	In Progress	GHG, Total amount of material composted	Launched Town Community Compost program in summer 2017; In 2018, 9 tons of organic materials were diverted via this program and over 100 households participated.	
Home composting initiative	In Progress	Tons	Home Composting education was part of 2017 Food Forum. Home composting information is available on the B2020 web site.	
Zero waste goal for public events and events on public land	In Progress	Tons waste generated at Public Events	Town requires that event organizers include recycling plan in applications for Town approval of events	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Table 7 Waste/Recycling Measures, Status, and Progress [continued]

Measure	Status	Recommended Metric	Progress	Co-Benefits
Green business programs	In Progress	# of businesses participating	Outreach and education efforts underway	
Plastic and paper bag fee/ reusable bag distribution	In Progress	Three grocery stores and three big box stores are impacted by the law. Approximately 10,000 reusable bags were distributed prior to the law taking effect	Town passed an ordinance for a 10-cent fee on plastic and paper bags in 2018 that took effect in April 2019.	
#6 plastic ban	In Progress	Ban implemented - yes/no	Local laws now require the recycling of Plastic #1-7.	
Tap water campaign	Not Started	Participants (residents/ businesses) pledging to eliminate plastic bottles	NA	

LAND AND WATER USE



The Town of Bedford has made notable progress since 2010 in advancing more sustainable land and water use strategies. In total, the Town has identified 20 measures (6 municipal and 14 community measures) that will reduce greenhouse gas emissions while simultaneously fostering smarter land use practices and greater water use efficiency.

The measures associated with land and water resources are divided into four focus groups: landscape alternatives, locally sourced food, transit-oriented development and water conservation. Several of the measures specific to land and water use are qualitative in nature, relating to the quality of something. When applicable, quantifiable metrics pertaining to land and water use are discussed, for example, water conservation efforts (gallons conserved). Although certain measures may be harder to quantify, they are as important in supporting the initiatives of Bedford 2020. As previously noted, The Great Healthy Yard Pledge as well as other Healthy Yards programs are efforts that focus on changing land management practices to well-being biological practices that sequester carbon in soil. Additionally, the measures outlined in this section, provide additional co-benefits such as job creation, cost savings, improved health, and improved awareness of municipal environmental programs. **Table 8** outlines the progress and status of land and water related measures identified in the Climate Action Plan.

Food Forum

In March of 2017 over 900 people gathered for the Bedford 2020 Food Forum. The Forum featured informative sessions and workshops to drive action around local food issues including the relationship between food and climate change, food waste, food security and access to local food/farms. A variety of community organizations and businesses participated, including local farms and community gardens. From the Food Forum, Bedford 2020 created new initiatives specific to local food issues to help reduce food waste and GHG emissions.

- Planet to Plate Campaign, focused on reducing one's carbon footprint by choosing locally sourced or meatless meals. Over 320 households took Bedford 2020's Meatless Monday pledge, a community-wide effort to remove meat from meals one day a week.
- Avoid Food Waste which includes promoting New York State legislature to mandate grocery stores to donate/rescue excess food which recently passed.

The modified rate structure implemented in 2013 to further encourage water conservation has resulted in a water usage reduction of approximately 5%.

The Great Healthy Yard Pledge is a program that works to eliminate the use of pesticides or chemical fertilizers on yards in Bedford. Synthetic chemicals are harmful to human health and have the potential to leach into groundwater and impact drinking water sources. Bedford residents signed up to protect over 4,400 acres in our Town (approximately 17% of the total area in Bedford).

The Town has a policy of not using chemicals or pesticides on municipal properties.

Bedford 2020 joined the Town of Bedford, the Bedford Conservation Board, the Bedford Audubon Society, Unitarian Universalist Fellowship of Northern Westchester, and Trillium Invasive Species Management, Inc. to eradicate the harmful invasive species hardy kiwi vine (Actinidia arguta) from areas of Bedford.

Programs geared towards the education and use of local food sources have been successful in Bedford, over thirteen institutions are participating in the Northern Westchester Local Food Project and nearly 50% of Northern Westchester Hospital's produce is from local sources.

Table 8 outlines the status and progress of these measures along with a recommended metric for tracking progress on each measure, and the co-benefits associated with each.

Table 8 Land and Water Measures, Status, and Progress

Measure	Status	Recommended Metric	Progress	Co-Benefits
MUNICIPAL LAND AND WATER MEASURES				
Water conservation (water saving shower heads, high efficiency toilets, water saving effects)	In Progress	Municipal water consumption; # of fixtures upgraded	Fixed leaks; installed low flow fixtures in one building	
Plant trees to shade buildings	Not started	# of trees planted that provide shade to municipal buildings	NA	
Low-maintenance landscaping	Implemented	Mowing frequency; fuel use from maintenance equipment	Parks Department uses mulch attachment on lawn mowers	
Non-asphalt pavements	Not started	% of municipal property with non-asphalt pavement	NA	
COMMUNITY LAND AND WATER USE MEASURES				
Transit oriented development	Not started	Transit Ridership; VMT	NA	
Build stormwater capacity through municipal codes and regulations	In Progress	Drafting and Implementation of Local Bylaws and initiatives to increase stormwater capacity	The town has implemented a conservation-oriented rate structure for our Consolidated Water District; and Implemented a sewer law that requires water conservation plans for property owners that change use or begin using more water.	
Modified town water billing system	Implemented	Water consumption (residential and commercial)	The rate structure was modified in 2013, showing a decrease in 5% water consumption.	
Water conservation (water saving shower heads, efficiency clothes washers, water saving faucets, high efficiency toilets, promote education, information, and training on water conservation and re-use systems)	Not started	Water consumption (residential and commercial)	NA	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Table 8 Land and Water Measures, Status, and Progress [continued]

Measure	Status	Recommended Metric	Progress	Co-Benefits
COMMUNITY LAND AND WATER USE MEASURES				
Increase supply, availability, and consumption of local food	Implemented	Quantity of local food sold and purchased	VegOut program provides resources to connect residents to local healthy food options Northern Westchester Local Food Program to increase local purchases at schools, hospitals and other institutions	
Plant and preserve trees	Implemented	Number of trees planted; annual change in number of trees	Received Tree Inventory grant in 2017 and completed tree inventory in 2018. The inventory resulted in the development of the Town Tree Management Plan setting the framework for major tree planting efforts across several Town properties.	
Low-maintenance landscaping	In Progress	Mowing frequency; fuel use from maintenance equipment	Community education around leaf mulching and electric lawn equipment	
Gasoline lawnmower replacement	In Progress	Amount of gasoline used for lawnmowing compared to baseline	Community education around electric lawn care equipment	
Non-asphalt pavements	Not started	% of pavement non-asphalt	NA	

Economic benefits/Job creation Quality of life and health Energy security Climate and GHG reductions

Bedford 2020 Progress Report Methodology

Prepared by VHB, October 2019

Overview

The purpose of this progress report is to calculate the progress that the Town of Bedford has made through its 2010 Climate Action Plan to reduce greenhouse gas (GHG) emissions through 2017 as compared to the Town's baseline GHG inventory conducted in 2004 by ICLEI. This Progress Report builds off of the 2004 baseline assessment completed by ICLEI in 2004 using its Clean Air and Climate Protection (CACP) tool. VHB calculated greenhouse gas (GHG) emissions reductions and tracked progress for the 2012 and 2017 Progress Reports using accepted industry standards and assumptions. Underlying data used to calculate the baselines were collected in the same manner across both the 2012 and 2017 Progress Reports. Data was provided by the Town of Bedford through various data sources (e.g., utility providers, waste haulers, and municipal departments). Where information could not be obtained it was calculated by VHB using assumptions and emission factors from accepted standard industry sources (e.g., the U.S. Environmental Protection Agency and U.S. Dept of Energy - Energy Information Administration).

It is important to note that measuring emissions, particularly on a community wide basis, is not an exact science and requires making calculated assumptions as it is not possible to access 100% of activity data on a community wide basis. It is also important to note that this analysis is an update to measure the progress since the Town of Bedford 2004 baseline inventory as well as the measures outlined in the 2004 Bedford Climate Action Plan (CAP) and is not a full GHG emissions inventory. However, by comparing the 2004 baseline and estimated 2017 emissions, this report is an effective tool to track, report, and drive community action and planning. The 2017 Progress Report relied on resources and data from the following sources:

- The Town of Bedford;
- Utility Providers;
  - New York State Electric and Gas Corporation (NYSEG)
  - Con Edison (ConEd)
  - Westchester Power
- The Town of Bedford Waste Consultant;
- Westchester County Public Works;
- U.S. Environmental Protection Agency – eGRID Factors[10];
- U.S. Environmental Protection Agency – 2018 Emission Factors for Greenhouse Gas Inventories and Global Warming Potential factors[12]; and
- U.S. DOE Energy Information Administration
- Mid-Hudson Regional Greenhouse Gas Emissions Inventory

The Greenhouse Gas Emissions Analysis Process

Greenhouse gas emissions are produced by the following sources: combustion of fossil fuels to produce the electricity that lights, heats and cools buildings, parks and streets; combustion of fossil fuels for heating and operating vehicles; and decomposition of waste occurring in landfills, incinerators and sewage treatment plants. (ICLEI Milestone Guide). A GHG emissions analysis converts usage from all of these sources into GHG emissions expressed in MTCO2e (metric tons of carbon dioxide equivalent).

For this report, VHB analyzed data for municipal operations and the community as a whole.

Actual usage data was available for:

- Majority of municipal consumption across energy and transportation sectors (provided by the Town of Bedford)

10 EPA 2016 eGrid Factors. https://www.epa.gov/sites/production/files/2018-02/documents/egrid2016_summarytables.pdf

12 EPA (2018). Emission Factors for Greenhouse Gas Inventories. Retrieved from https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

- Aggregate community wide electricity and natural gas consumption (provided by our utilities, Con Ed and NYSEG)
- Community wide waste and recycling data collected and reported to the Town quarterly (provided by haulers and Town's waste consultant)

Estimated usage was calculated for:

- Community fuel oil using US DOE Energy Information Administration data on average fuel consumption in the Northeast region.
- Community wide transportation was estimated by extrapolating from 2010 data from the Mid-Hudson Regional Greenhouse Gas Emissions Inventory.
- Community wide use of renewable electricity using data supplied by Westchester Power and independent energy service companies operating in Bedford

How data is translated to emissions:

Because usage data collected for this analysis was available in different units of measure (e.g. electricity is measured in kilowatt hours (kWh); transportation fuels, propane, and oil is measured in gallons, and natural gas is measured in therms), VHB converted all of the data (actual and estimated) into MMBtu's (British Thermal Units) in order to create a single unit of energy measurement. Once the data was compiled, standard industry emissions factors were used to calculate emissions as expressed in Metric Tons of Carbon Dioxide equivalent (MTCO2e). 2017 emissions were then compared to the 2004 baseline to determine the Town's progress.

There are many influences that impact and contribute to GHG reductions. In addition to specific actions taken in Bedford by our local government, individual citizens and the broader community, the Town also benefited from state actions and policies to reduce the fossil fuel intensity of the grid and generate more renewable energy sources (as outlined on pages 7 and 8 of the Progress Report). All of these contributors are reflected in the final results.

The following describes the step by step methodology for sourcing and calculating usage data – and calculating emissions for both municipal and community usage.

Overall Reduction

Municipal

To quantify GHG emissions associated with key sectors of energy and transportation in 2017, VHB used data from stationary (e.g., buildings, street lights, etc.) and mobile (e.g., gas and diesel consumption) sources and multiplied this data by location specific emissions factors and respective Global Warming Potential (GWP).[13] These calculations are further described below. To calculate the overall municipal GHG reduction in metric tons of carbon dioxide (MTCO2e), the 2017 GHG emissions were calculated using consumption data from the Energy and Transportation sectors.[14] The GHG emissions from these sectors were totaled, and this value was subtracted from the 2004 baseline to determine the overall reduction. To calculate the percent reduction from the 2004 baseline, the 2017 GHG emissions value was subtracted from the 2004 GHG emissions, and that number was divided by the 2004 GHG emissions (baseline).

Community

To calculate the overall community GHG emissions reduction in MTCO2e, the 2017 GHG emissions from each focus area: Energy, Transportation, and Waste were calculated and summed to equal the total 2017 GHG emissions (in MTCO2e).[15] The emissions reduction value was determined by subtracting the 2017 GHG emissions value from the 2004 baseline. To calculate the percent reduction from the 2004 baseline, the 2017 GHG emissions value was subtracted from the 2004 GHG emissions, and that number was divided by the 2004 GHG emissions (baseline).

13 Global Warming potential numbers utilized were provided in the 2018 U.S. EPA Emission Factors for Greenhouse Gas Inventories. Updated 03/09/2018

14 For the 2017 Progress Report there were not any quantifiable reductions in MTCO2e for the Municipal calculation in Waste and Recycling and Land and Water focus areas. Waste emissions were used in the Community Energy calculation.

15 For the 2017 Progress Report there were not any quantifiable reductions in MTCO2e for Land and Water measures or programs.

Energy Consumption

Municipal

New York State Electric and Gas Corporation (NYSEG) and Con Edison Energy (ConEd) energy consumption data for the Town of Bedford buildings, streetlights, water treatment/distribution facilities/equipment, recreational lighting and other equipment, was provided by the respective utilities via Bedford 2020 staff. Total Energy (MMBTu) was calculated by converting electricity usage (in kWh) to MMBTu using the standard conversion factor (1 kWh = 0.003412 MMBTu). Energy usage from natural gas was provided in therms which was converted to MMBTu using the standard conversion factor (1 therm = 0.1 MMBTu). The calculated total energy (in MMBTu) for each facility (e.g., buildings, street lights, water tanks, etc.) was totaled to determine the total 2017 Municipal stationary energy usage.

GHG emissions (MTCO2e) were calculated using local emissions factors for electricity and a standard emissions factor for natural gas. The U.S. Environmental Protection Agency (EPA) 2016 eGRID Factors – NPCC NYC/Westchester and NYUP NPCC Upstate NY (total output emissions factors) were applied to the electricity data (in kWh) for each facility.[16] The NPCC NYC/Westchester eGRID sub-region was utilized for the baseline inventory and 2012 progress report calculations. For this inventory update, a combined factor was used to more accurately reflect the mix of electricity sourced from both regions, which have different energy generation profiles.

It should be noted that the use of this new electricity emissions factor has meant that, despite an overall increase in stationary energy use of 3,372 MMBtu, total emissions resulting from stationary energy use have decreased. It should also be noted that the primary driver of the increase in energy consumption was the new Water Filtration Plant, responsible for more than 3,600 MMBtu. Without this new facility and its associated consumption, the Town would have had an overall energy reduction and even greater reduction in GHG emissions. However, given the improvements to the grid and increased use of emissions-free energy for electricity production between 2004 and 2017, the total emissions associated with stationary energy were still lower than in 2004.

The EPA Emission Factors for GHG Inventories natural gas factor was applied to the natural gas data.[17] Heating oil and propane factors were also applied to heating oil and propane consumption values. These emissions values were then multiplied by their respective global warming potential (GWP) to approximate CO2 equivalent and converted to metric tons. The energy and GHG emissions values for each facility were summed to equal the total 2017 Municipal GHG emissions.

It is important to note that the original 2004 baseline inventory had an error in calculation of municipal natural gas emissions. That error was accounted for and total emissions adjusted in the 2012 progress update and was carried through to the 2017 update as well.

2012 Municipal Energy Amendment Calculation

In 2012, fewer municipal outdoor lighting, street and traffic light energy consumption data was reported which resulted in a decreased 2012 Municipal stationary energy value. To amend the 2012 Municipal energy usage and MTCO2e data, a calculation was completed to adjust the total energy and GHG emissions. This was completed by determining the average annual reduction (in MMBTu) between 2004 and 2017; for example, 2004 Energy Usage (MMBTu) minus 2017 Energy Usage (MMBTU) divided by the number of years (13). The average annual reduction per year was multiplied by eight, the difference in years (from 2004 to 2012) and then added to the reported 2012 street light and outdoor lighting energy usage and GHG emissions numbers reported in 2012 to amend the report 2012 number. The same process outlined above was repeated for GHG Emissions (MTCO2e).

It is important to note that the 2017 progress report does not include the interim 2012 data, but we have included the above calculation methodology to accompany the calculation completed within the spreadsheet.

16 EPA 2016 eGrid Factors. https://www.epa.gov/sites/production/files/2018-02/documents/egrid2016_summarytables.pdf
17 EPA (2018). Emission Factors for Greenhouse Gas Inventories. Retrieved from https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

Community

New York State Electric and Gas Corporation (NYSEG) and Con Edison Energy (ConEd) data was provided by Bedford 2020 by sector (e.g., residential, commercial, other). The energy consumption or usage data (in kWh and/or therms) was used to calculate the total energy (MMBTu) and GHG emissions (MTCO2e) for stationary energy sources. Total Energy (MMBTu) was calculated by converting electricity usage (in kWh) to MMBTu using a standard conversion factor (1 kWh = 0.003412 MMBTu). Natural gas data was provided in decatherms.

Heating oil consumption was estimated for the 2017 update. This estimate was made by using US DOE Energy Information Administration data on average end-use fuel consumption in the Northeast region.[18] The following tables from 2015 and 2005 were used as proxy years for 2017 and 2004 to estimate the change in average fuel oil consumption during that time frame.

- Table CE4.7 Annual household site end-use consumption by fuel in the Northeast—averages, 2015
- Table US9. Average Consumption by Fuels Used, 2005 Million British Thermal Units (Btu) per Household

The 33.7% reduction in average heating oil consumption was applied to the 2004 baseline heating oil consumption total as an estimate for 2017 heating oil use.

The total stationary energy (in MMBTu) was totaled from electricity, natural gas, and heating oil data.

GHG emissions were calculated by applying standard emissions factors to community electricity and natural gas data, the calculated values were summed to determine the 2017 Total Energy and GHG emissions. The U.S. Environmental Protection Agency (EPA) 2016 eGRID Factor – NPCC NYC/Westchester was applied to the electricity data (in kWh)[19] for the portion of electricity from ConEd. The 2016 eGRID factor – NYUP-Upstate NY factor was applied to the electricity data (in kWh) for the portion of electricity from NYSEG. Natural gas emissions factors taken from the Local Government Operations Protocol, Appendix G, were applied to natural gas consumption data. Emissions factors used for the natural gas calculation were: 53.02 kg CO_2 per MMBTu, 0.005 kg CH4 per MMBTu, and 0.0001 kg N2O per MMBTu. Emission values were then multiplied by their respective GWP to approximate total CO2 equivalent and converted to metric tons. Greenhouse gas emissions for heating oil were calculated from that consumption value using standard emissions factors for fuel oil provided in the Local Government Operations Protocol for Greenhouse Gas Inventories.

It is important to note that an error in the 2004 baseline inventory calculation of GHG emissions from residential heating oil was found during this 2017 update. That error was accounted for and total emissions adjusted for the baseline value.

2017 data also accounted for the portion of community electricity that is being supplied through Bedford's Community Choice Aggregation program, through Westchester Power. Based on email communication from Westchester Power, VHB was advised to utilize total community electricity consumption and then subtract out the portion already in ESCOs and a portion due to attrition to get to total energy use from renewable sources. This portion was included in total energy consumption but removed when calculating GHG emissions, since it is from emissions-free sources. This amount represents 10,806 MTCDE of avoided emissions.

The significant decrease (51%) in GHG emissions from stationary energy at the community scale despite only a 4% decrease in overall stationary energy consumption is a result of two factors. First, estimated heating oil/natural gas energy consumption suggests a shift from heating oil to natural gas within the residential sector and natural gas consumption generates fewer GHG emissions than fuel oil. So despite a 9% decrease in heating oil/natural gas energy, emissions from these sources went down 15%. Second, the most significant factor, is a shift to cleaner sources of electricity. While there was actually a 2% increase in electricity consump-

18 EIA Northeast Region includes New England and Mid-Atlantic States (PA, NJ, NY, CT, MA, RI, VT, NH, ME).
19 EPA 2016 eGrid Factors. https://www.epa.gov/sites/production/files/2018-02/documents/egrid2016_summarytables.pdf

tion, the reduced emissions resulting from cleaner grid-supplied energy, as well as a large portion of the community participating in the CCA, resulted in a 77% decrease in electricity emissions.

Transportation

Municipal

The Municipal Vehicle Fuel data was analyzed for the reduction in consumption (e.g., gallons of gas and diesel), and to calculate the 2017 Vehicle Fuel Energy in MMBTu and $MTCO_2e$. The total gallons of gas and diesel fuel consumed by municipal vehicles was adjusted to reflect the municipal-only consumption by subtracting the gas and diesel used by non-municipal vehicles from the reported value. Non-municipal gas and diesel consumption data was provided by Bedford 2020; the adjusted diesel and gas consumption values were used in all calculations pertaining to municipal vehicle energy usage. Emission factors from the EPA for both gasoline (8.78 kg CO_2 per gallon) and diesel (10.21 kg CO_2 per gallon) fuels were applied to consumption values (in gallons).[20] The amount of CH_4 and N_2O emitted from municipal vehicles were calculated by applying EPA emission factors.[21] Total emissions for CO_2, CH_4, and N_2O were multiplied by their GWPs and converted to metric tons.[22] Gas and Diesel conversion factors from the U.S. Energy Information Administration (EIA)[23] were multiplied by gas and diesel fuel data to calculate the total energy in MMBTu.

Data pertaining to municipal vehicles; for example, year, department, and vehicle type was provided by Bedford 2020. Vehicle fleet changes are calculated by counting vehicle type, for example, car, truck, SUV, including hybrid and electric. The total numbers of vehicles per type were then compared to 2004 and 2012 vehicle fleet data.

Community

New data was not available for community-wide transportation. Therefore, community transportation was calculated by determining the annual reduction from 2004 to 2012, this annual reduction in MMBTu and $MTCO_2e$ was extrapolated out to a five-year total and utilized to determine the 2012 to 2017 reduction. 2004 data was taken directly from the 2004 GHG emissions inventory. 2012 data was taken from the Mid-Hudson Regional Greenhouse Gas Emissions Inventory. Consult that inventory's methodology for additional details on transportation emission calculations for 2012.

Waste

Municipal

There were no Municipal Waste calculations.

Community

The diversion rate and percent of recycled materials were both calculated from data provided by Bedford 2020. For the diversion rate, the total weight (in tons) of recycled, yard waste and miscellaneous recycling (e.g., clothes, electronics) were summed, this value was divided by the weight (in tons) of Total Materials in 2017 to determine the amount of material diverted from waste facilities. The percent of recycled materials was determined by adding the weight of recycled (via single-stream) and miscellaneous recycled materials (in tons), then dividing that value by Total Materials (in tons).

The average annual GHG reductions (in $MTCO_2e$) was calculated by a waste consultant and provided by Bedford 2020.

Land and Water

There were no calculations for land and water metrics. Discussion was qualitative only.

20 EPA (2018). Emission Factors for Greenhouse Gas Inventories. Retrieved from https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

21 EPA (2018). Emission Factors for Greenhouse Gas Inventories. Retrieved from https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

22 EPA (2018). Emission Factors for Greenhouse Gas Inventories. Retrieved from https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

23 EIA Energy Units and Calculators. https://www.eia.gov/energyexplained/index.php?page=about_energy_units

Glossary

CH_4: Methane, a powerful greenhouse gas

CO: Carbon Monoxide

CO_2: Carbon Dioxide

CO_2e: Carbon dioxide equivalent units – converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases on comparable terms

Community Choice Aggregation (CCA): Also known as municipal aggregation, are programs that allow local governments to procure power on behalf of their residents, businesses, and municipal accounts from an alternative supplier while still receiving transmission and distribution service from their existing utility provider.

Energize Bedford: The local effort of Energize NY, a community-based energy efficiency program operating within the Energy Improvement Corp (EIC), a New York State local development corporation.

Energy Improvement Corporation (EIC): A New York State local development corporation, whose mission is to facilitate and finance qualified energy efficiency improvement projects and renewable energy system projects for residents, organizations, institutions and businesses in participating municipalities in New York.

EPA WARM Model: The EPA Waste Reduction Model (WARM) calculates and totals the GHG emissions of baseline and alternative waste practices including source reduction, recycling, anerobic digestion, combustion, composting and landfilling. WARM Version 14 was launched in March 2016, the first versions of the WARM model were released in 1998.

EV: All-electric vehicles (EVs) run on electricity only. They are propelled by an electric motor (or motors) powered by rechargeable battery packs.

GHG: Greenhouse Gas, the term used for gases that trap heat in the atmosphere. The principal greenhouse gases that enter the atmosphere as a result of human activity are carbon dioxide, methane, and nitrous oxide

Hybrid Electric Vehicle (HEV): A type of hybrid vehicle and electric vehicle which combines a conventional internal combustion engine (ICE) propulsion system with an electric propulsion system.

kW: A kilowatt, equal to 1,000 watts

kWh: A kilowatt hour (1,000 watt-hours), the work performed by one kilowatt of electric power in one hour

LEED: Leadership in Energy and Environmental Design, a commonly used green building standard developed by the U.S. Green Building Council

Metric ton: 1,000 kilograms (or 2,204.6226 lbs.), also known as a "tonne."

MMBTu: Million British Thermal Units, unit of energy equivalent to 10 therms

PACE (Property Assessed Clean Energy) financing: A loan alternative that incentivizes renewable energy system installation and energy efficiency improvement by avoiding the high up-front energy equipment and installation costs associated with each

PM_{10}: Course Particulate Matter

NOx: Nitrogen Oxides

PV: Photovoltaics, a solar power technology that converts sunlight into electricity

Single Stream Recycling: Is a process that does not require the sorting and separation of materials sent to be recycled.

SOx: Sulfur Oxides

Therm: 100,000 British Thermal Units (BTUs), equivalent to approximately 100 standard cubic feet of natural gas

$MTCO_2e$: Metric Tonnes of CO_2 equivalent

VMT: Vehicle miles traveled

Zero Waste: goal to eliminate waste sent to the landfill, or in Bedford's case, incinerator, by 2020. All of the community's discarded material would be recycled or reused.

This report was prepared by VHB
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