2019 Appendix to the February 2012 Climate Action Plan (addressing only Croton-on-Hudson)

Prepared by Croton's Sustainability Committee

For further information:
(Mr.) Lindsay Audin CEM LEED AP
Chair, Croton Sustainability Committee
& CSC Coordinator for Croton
laudin@crotononhudson-ny.gov
914-271-6501

Table of Contents

2019 Appendix to the Climate Action Plan (CAP) for Croton-on-Hudson

Introduction

In 2012, a Climate Action Plan (CAP) was produced by Ecology & Environment, Inc. for six Westchester County communities. This appendix focuses only on aspects of it that were related to Croton-on-Hudson, a village within the Town of Cortlandt. The CAP developed GHG and energy reduction data for each of the communities. This appendix updates its findings and recommendations related to Croton. It shows how most of them were subsequently achieved, and supplements them with additional actions and opportunities. It found a measured 15% reduction in municipal GHG.

Municipal Measures Recommended and Completed

The following measures were identified at both the municipal and community levels. Standard text is from the 2012 CAP, which is followed (in italics) by measures that were subsequently taken. Following them (in bold) are those that Croton plans to take.

From section 3.2.2 of E&E's CAP, page 18, these municipal measures were recommended.

1. Implement energy efficiency measures at municipal buildings and provide the community with information on results.

- programmable thermostats were installed in each zone between 2014 and 2016.

- the burner in the Municipal Building's oil-fired boiler was replaced in 2016 with a new dual-fuel unit that now primarily burns natural gas.

- all lighting in the Municipal Building, the three firehouses, and the new Department of Public Works (DPW) facility was converted to LED in 2018-19.

- bi-level LED fixtures were installed in the Municipal Building's stairwells, and occupancy sensors added to its bathrooms, pantry and community room in 2018; between 2013 and 2015, others were added in rooms at the firehouses.

- all street, parking lot, and park lights were replaced with LED units between 2016 and 2019.

- construction of a 250 kWac rooftop PV system is in process on the rooftop of the DPW facility.

Croton Residential Street Light Oneida/Young 9-1-19

- all the above have been detailed at public Board of Trustees (and other community) meetings, and via postings at the web page of Croton's Sustainability Committee (sustain-croton.org).

Going forward, we plan to:

- review (and where feasible) add community solar systems via PV carports over parking areas at our train station lot and those of two riverside parks. Other municipal rooftops will also be reviewed for solar installations.

- specific HVAC and envelope options at the new DPW facility have been evaluated and (pending available funding) will be pursued (e.g., lobby window film, HVAC heat recovery).

2. Contact Con Edison and conduct further investigation of the Grand Street Firehouse electricity use and billing to correct unaccountable electricity usage and cost identified in the energy audit.

- by 2014, the problem was investigated and corrected through repairs and better controls on that firehouse's AC system.

No further action is needed. The rooftop PV system at that firehouse was checked in 2018 and its successful ongoing operation verified by a solar system specialist.

3. Continue the municipal green fleet program and demonstrate progress to the community.

- in late 2018, a new plug-in hybrid vehicle replaced a gasoline-powered car used for traffic enforcement. It was delivered in May 2019. In December 2019, a fully electric vehicle was purchased to replace the Fire Inspector's gasoline-powered car.

- earlier in 2019, a dual port electric vehicle charger was installed at the Municipal Building to charge municipal EVs. Another dual port charger was installed at the same site for public use, and/or additional municipal electric vehicles as they are purchased.

In 2020, two hybrid Police Interceptor vehicles will replace gasoline-powered police cars.

Based on a recently completed fleet inventory, other vehicles are being considered for replacement by EVs, based on age and condition.

We will continue to review, monitor, and (where practical) pursue grant opportunities (e.g., under the VW Diesel Settlement) that help cover the first cost of EV trucks to replace diesel units.

4. Offer preferred parking to carpool and hybrid vehicles at train station parking lots.

- in 2019, a dual port EV charger was added for public use at the train station at spaces now labeled as dedicated to EVs. A parking ordinance was created to ensure use only by EVs at all municipal chargers.

As solar carports are added at the train station (and other) Village parking lots, we plan to sequester several more spots for EVs by installing chargers with the carports.

5. Encourage use of mass transit, and plan new or expanded walking and cycling routes that connect residential areas with business districts, downtown, and commercial areas.

- between 2015 and 2019, bike routes and racks were set up around the Village, with sharrow markings and dividing lines to define them. Large racks were set up at the train station under a covered section of the station for security and to ensure they remained dry during rain.

Croton's Bike/Pedestrian Committee is developing its new Master Plan that will include expanded options for access to the Croton-Harmon train station and commercial sites throughout the Village.

6. Work with other NWEAC communities to strengthen their composting efforts.

- in 2019, a DEC grant was received for a pilot drop-off food scrap recycling project.

It will gather scraps and transport them to a new commercial composting facility being built in nearby Cortlandt. It is scheduled to be open in spring 2021. Forty to fifty families will be involved in the 6-month pilot. Data from it will be used to evaluate a Village-wide program.

7. Expand the water savings educational program for residential and commercial users, and work with large users to reduce summer water use.

- starting in 2018, the Village's water billing was changed from semi-annual to quarterly. Its tariff was modified to encourage water efficiency by the largest users (e.g., Metro-North train washing facility), resulting in a 20% drop in both Village water consumption and a comparable drop in kWh for water pumping.

As detailed below, other technical efforts are being pursued to further reduce water use and energy used to pump it.

EV charger at Croton Municipal Building.

8. Continue to investigate and implement water and energy efficiency opportunities in the water distribution facilities, including review of energy demand, usage, and cost metrics identified in the energy assessment.

- a water system audit was completed in 2012, and several of its recommendations subsequently pursued. By 2018, motors for all four water pumps had variable speed drives (VSD) that helped reduce pump power consumption per CCF.

- in 2019, the Sustainability Committee installed a water system pressure logger that produced 15-minute interval data in PSI. It helped us understand the drivers (e.g., sudden surges in usage) that create peak electric demand and kWh consumption by the system. That data will help us dispatch the pumps with greater energy efficiency.

In late 2019, we were able to expedite installation of 'smart' utility electric meters on all water pumping stations. As we are able to secure 15-minute interval data from them, we will evaluate ways to better dispatch the pumps to further reduce kWh/CCF.

Our efforts at the municipal level have yielded a 15% reduction in our GHG inventory. The 2012 CAP (at its figure 2-1 on page 10) determined our 2010 municipal footprint to be 1,670 metric tons (MT) per year. By way of our 2018 GHG inventory, we found it had dropped to 1,419 MT/yr, despite addition of vehicles, expanding our parks, etc. Find the results of our 2018 GHG inventory at the end of this document.

Fulfillment of Action Table Items

The 2012 CAP also included the following Action Table, found on its page 64. Bolded text indicates the actions that were subsequently taken.

- Assign Climate Action / Sustainability Team: **Croton's Sustainability Committee was established in 2009. In 2019, it was designated as the Village's Climate Smart Community (CSC) Task Force, and its chair designated at the Village's CSC Coordinator.**

Leadership and Direction: **The chair of the Sustainability Committee was replaced in 2015 with a Certified Energy Manager (CEM) holding LEED AP accreditation. Other engineers were added in 2016, allowing us to expand and expedite the actions detailed above.**


PV system on Croton firehouse roof

Coordination and Oversight: **Closer liaisons and memoranda of understanding with other Village committees were established, and the Mayor and another Village Trustee became members of the Sustainability Committee. It now gives annual reports on its activities to the Village Board.**

Awareness and Outreach: **The Committee's web page was expanded with additions of reports and data on municipal energy usage, GHG emissions, projects, etc. Since 2016, both the Coservation Advisory Council (CAC)and the Sustainability Committee have sponsored and/or developed events featuring ways for community members to cut their carbon footprints, evaluate and secure electric vehicles, use Village EV chargers, etc.**

Project Implementation: **As detailed above, many energy projects (some supported by grants) have been implemented. In 2016, conversion of all street lighting to LED was completed. In 2017, Croton became a Clean Energy Community (CEC) based on its implementation of tasks required by that designation. In 2018, Croton won a $50,000 CEC grant that funded an LED upgrade of all lighting in its 5 municipal buildings. A $24,000 DEC grant was received in mid-2019 for completion of the installation of 3 dual port EV chargers. A $14,000 DEC grant was won in late 2019 to fund the pilot food scrap recycling project. A process in now in place for evaluating and developing new projects.**

Rank and prioritize climate action measures: **Within a limit of 10-year simple payback (net of grants, discounts, and rebates), projects with the greatest GHG tonnage reduction per invested dollar are given precedence.**

Establish timelines and tracking mechanisms: **Tracking is done through annual Portfolio Manager reporting which commenced in 2018, and is posted at our web page (https://www.crotononhudson-ny.gov/village-manager/pages/energy-benchmarking). Timelines are impacted by available funding.**

Secure sources of funding for priority projects. **Grant options are continually reviewed for opportunities, and vigorously pursued. For internal funding, a significant portion of revenue from leasing of Village roof and land space for community solar projects may be allocated to projects that cut GHG emissions and energy use.**

Implement priority projects. **PV carports at parking lots (to include EV chargers) and replacements of Village cars and light trucks with EVs are presently our highest priorities.**

Perform annual reevaluation of energy use and costs. **Portfolio Manager reporting has been a required Village function since 2018 and will continue to provide such annual evaluations.**

Community Measures Recommended and Completed

On its page B-6, the 2012 CAP identified the following community actions for Croton. As above, the italicized material was subsequently done, and bolded text indicates the next steps in our CAP.

1. Implement recommended energy efficiency measures at municipal buildings and provide the community with information on results. Croton-on-Hudson has strong support from its leadership, staff, and community to continue to pursue energy efficiency projects. Support and knowledge from an experienced volunteer Sustainability Committee is a key asset of the village.

Specific energy efficiency projects have been listed by building in the Village of Croton-on-Hudson Energy and GHG Recommendations Report, Croton-on-Hudson Firehouse Energy Audit, and Croton-on-Hudson Water and Wastewater Energy Assessment.

Projects that already reduce energy costs and GHG emissions need to be publicized. More than half of the community survey responses identified reducing energy costs and municipal GHG building emissions as a high priority.

Croton-on-Hudson should also continue to pursue energy performance contract options, working with elected officials, staff, and contractors to devise a contract that is agreeable to all parties. The experience will inform future actions within Cortlandt and other NWEAC communities.

- As detailed above, many of the municipal energy measures were subsequently implemented. The Sustainability Committee's leadership and membership were improved by the addition of professionals involved in energy and climate action endeavors.

- Proposed projects were publicized through community surveys (most recently in March 2019), educational events, Village Board meetings, and postings at the Sustainability Committee's web site.

- A contract to develop a 250 kWac community solar system on the rooftop of our DPW facility was signed in August 2019. It is serving as a template for others' use.

See prior pages for details on CAP actions to be taken at the municipal level.

2. Contact Con Edison and conduct further investigation of the Grand Street Firehouse electricity use and billing to correct unaccountable electricity usage and cost identified in the energy audit.

- As previously stated, this issue was fully resolved.

No further action is required.

3. Continue the municipal green fleet program and demonstrate progress to the community. Support is generally strong for this measure as about half of community survey respondents indicated that replacing the municipal fleet with hybrid, electric, or alternatively fueled vehicles was a high priority.

- By way of the replacement of police and fire vehicles with EVs, and a November 2019 presentation on EVs and Croton's new EV chargers, we continue to inform and assist the community with replacing its gasoline-powered vehicles with EVs.

In furtherance of the above, we will evaluate more chargers on public property. We have researched and will pursue installation of fast EV chargers at our local shopping center.

4. Offer preferred parking to carpool and hybrid vehicles at train station parking lots. Although support for preferred parking at train stations is evenly split between high and low priority, the community may respond well to this measure if Croton-on-Hudson provides priority and / or reduced price parking spaces as an incentive to carpoolers, and those investing in hybrid vehicles.

- As previously detailed, parking spots at the train station are now designated for EVs when using Village EV chargers. A parking ordinance was created to enforce that designation.

As funding permits, we plan to add more EV chargers at municipal properties (e.g., parks, train station, DPW facility).

5. Encourage use of mass transit, and plan new or expanded walking and cycling routes that connect residential areas with business districts, downtown, and commercial areas. The Croton-on-Hudson community shows support for this measure. Over half of survey respondents marked it as a high priority. Croton-on-Hudson can refer to Peekskill's Complete Streets initiatives for experience and ideas to improve pedestrian and bicycle programs.

- As previously detailed, our Bike/Pedestrian Committee is revising its Master Plan. It plans to seek from the Village Board a Complete Streets resolution, and to incorporate the Complete Streets Policy into its Master Plan.

6. Work with other NWEAC communities to strengthen their composting efforts. Croton-on-Hudson can encourage other NWEAC communities to get involved in the regional comprehensive approach to organic yard waste being developed in collaboration with Croton-on-Hudson and the Westchester County Department of Environmental Facilities. Recognizing this solution as a potential source of revenue may spur further interest in the exploring other regional waste management solutions.

- Croton's Conservation Advisory Council (CAC) has been a vanguard in the "love 'em and leave 'em" campaign toward yard leaf waste.

As detailed above, Croton will be initiating a pilot food scrap recycling program that will bring the scraps to a new commercial composting facility in Cortlandt opening in the spring of 2020.


Bike lane sharrow on Croton street

7. Expand the water savings educational program for residential and commercial users, and work with large users to reduce summer water use. Investigations of Croton-on-Hudson's water facilities identified the need to reduce water use during the summer, which will consequently reduce energy use, costs, and GHG emissions.

Expanding and promoting existing programs, such as the rain barrel program could increase participation and water savings. Efforts should focus on the golf course as a major water user.

- Both the Metro-North train maintenance facility and the local golf course have been responsive to efforts to minimize water consumption, as evidenced by a 20% drop in total annual consumption.

- Our web page now includes water saving measures and tips.

Other options for cutting water waste may be pursued as they become viable (e.g., dual flush toilet retrofit kits, pressure reduction in buildings).

8. Continue to investigate and implement water and energy efficiency opportunities in the water distribution facilities, including review of energy demand usage and cost metrics identified in the energy assessment.

See above for details on VSD pumping, interval pressure data analysis, and plans for analysis of individual pump station interval electric data to ferret out ways to cut water system power peak demand and consumption.

The following <u>additional</u> community-level GHG efforts (not mentioned in the 2012 CAP) are now in process.

a) Helping residents and small businesses cut their energy use and cost:

- the EnergizeNY and SolarizeNY programs have each been sponsored twice by the Village, resulting in dozens of homes being made more efficient and/or having solar panels installed on their roofs.

- assistance was provided to residents seeking cleaner heating fuels; several dozen homes were converted from oil to gas heat, and another had a heat pump installed in a newly constructed home.

- Community Choice Aggregation (CCA) was adopted in 2017, and presently serves about 75% of homes and small businesses.

- power from the DPW community solar system will be first offered to low-to-middle income (LMI) homeowners, bringing them a ~10% discount on their electric bills.

We plan to pursue additional Energize/Solarize/Clean Heat programs in the future.

b) Investigate options for microgrid development for a portion of the community to enhance resilience and safety:

- in 2016, Croton won a $100,000 grant that funded a study of a microgrid covering critical facilities.

c) Working with the local school district:

- Two m*embers of the Sustainability Committee are now also members of the school district's Environmental Sustainability Committee (ESC), formed in 2018. Through that representation, we have successfully pressed for Portfolio Manager benchmarking of the schools' buildings. With our urging, the school district has also moved ahead on a new performance contract for its facilities. We have also met with the school district's Transportation Coordinator to review options for funding EV school buses, and possible installation of solar busports at the district's bus depot.*

- **We look forward to assisting with upgrading all school lighting to LED, and for installation of community solar on school rooftops. As electric school buses become economical and practical in our area, we will assist with securing grants and other financial support for them.**

d) Working with other community institutions:

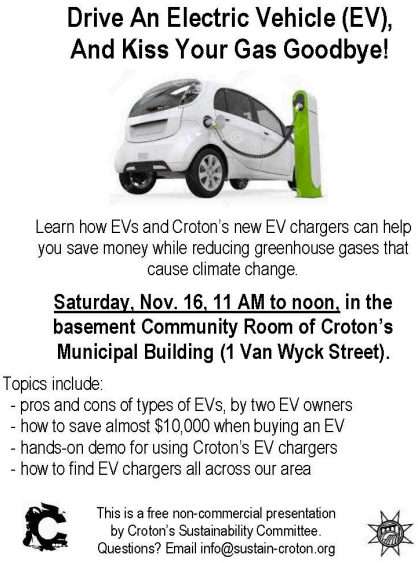
- We have approached the local free library (not part of the Village government) to upgrade its lighting to LED, and to use its rooftop for a community solar system. Working with the contractor on our DPW PV system, we helped develop design proposals.

We will assist further with implementing those options as templates for use with other local institutions in both Croton and nearby communities.

e) Working with large commercial energy users:

We look forward to working with large commercial facilities (especially our local shopping center and the Metro-North train maintenance facility) to consider rooftop-based community solar systems and, where appropriate, installation of carports and EV chargers. Both large facilities have already upgraded their outdoor lighting to LED.

In so doing, we plan to update our community GHG inventory with actual (not rule-of-thumb) GHG/energy data from those (and other commercial) facilities to ensure an accurate community assessment. Helping them understand that other climate-friendly options will improve their bottom lines is a challenge we believe to be worth pursuing.



GHG Reduction Targets

While no specific targets for Croton were specified in the 2012 CAP, it recommended that "communities should seek to reduce GHG emissions by 20% between 2010 and 2020 and by 80% between 2010 and 2050." By resolution of Croton's Village Board, those numbers were adjusted to seek a reduction of municipal GHG by 20% between 2010 and the end of 2025, and 10% of community GHG between 2010 and 2030.

Municipal GHG Targets

As previously mentioned, we have verified a 15% reduction in overall annual municipal GHG emissions between 2010 and 2018. Based on data filed in our Clean Energy Community submissions, our efforts just in municipal buildings have cut their GHG by almost 40%.

GHG impacts of several measures taken in 2019 will not be seen until its data is collected in 2020. Other measures will not have been completed until the end of 2020.

At this point in time, we believe it is too speculative to target a 2050 GHG target. Much of that reduction will depend on success in decarbonizing the State's power grid. We therefore look forward to developing such a target in the next decade as the extent of that decarbonization becomes clearer.

Community GHG Targets

The main success at the community level was adoption of Community Choice Aggregation (CCA) in 2017. Based on data from Table 32 on page 51 of the 2012 "Mid-Hudson Regional Greenhouse Gas Emissions Inventory" produced by ICF International, and taking into account the ~75% penetration of CCA in Croton, we calculate a community-wide GHG reduction due to CCA to be between 9% and 10% of that study's annual carbon footprint for Croton (i.e., 80,744 MT/yr).


Earth Day 2019 in Croton

While many homes have been made more energy efficient and/or had solar panels installed on them, those facilities represent only about 5% of all Croton homes. Anecdotally, we have seen installations of LED lighting in commercial buildings and parking lots, and at industrial facilities, but have no way to track their impact at this time. We therefore cannot make a statement on the impacts of those efforts. We therefore do not claim a 20% reduction in community-wide GHG has been achieved at this time.

Setting a community-wide target will entail an updated community GHG inventory and an evaluation of what measures could be taken to achieve it. We look forward to developing such a target in the next decade as the extent of decarbonization of the State's power grid becomes clearer.

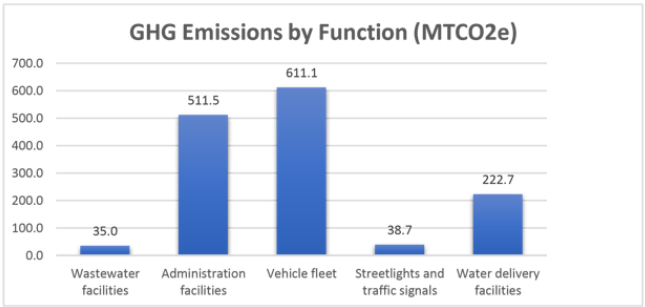
Summary of Croton's 2018 Municipal GHG inventory

Section 1:	Facility Energy Use and GHG Calculations									
		Elec. (kWh)	Gas (Thms)	Propane (gals)	oil (gals)	Elec (MT)	Gas (MT)	Prop. (MT)	Oil (MT)	Total MT
Facility / Group Name	ICLEI Category	2018	2018	2018	2018	2018	2018	2018	2018	2018
EMS House	Administration Facilities	16,265	-	91	-	4.7	-	0.53	-	5.23
Municipal Building	Administration Facilities	227,760	13,849	-	691	65.8	74.89	-	7.15	147.86
Grand St. Firehouse	Administration Facilities	96,800	7,521	-	-	28.0	40.67	-	-	68.65
Harmon Firehouse	Administration Facilities	106,720	6,902	-	464	30.8	37.33	-	4.81	72.97
Washington Firehouse	Administration Facilities	39,078	228	-	2,530	11.3	1.23	-	26.20	38.72
DPW Garage (Veterans)	Administration Facilities	70,680	15,891	1,886	-	20.4	85.94	11.07	-	117.43
New DPW Garage (Yorktown Rd)	Administration Facilities	57,000	-	-	1,882	16.5	-	-	19.48	35.95
Street & Parking Lot Lighting	Streetlights and traffic s	134,017	-	-	-	38.7	-	-	-	38.73
Water Pumps	Water delivery facilitie	691,220	-	3,907	-	199.7	-	22.93	-	222.68
Wastewater Pumps	Wastewater facilities	77,327	-	2,151	-	22.3	-	12.63	-	34.97
Parks & Rec	Administration Facilities	74,770	-	517	-	21.6	-	3.04	-	24.64

Section 2:	Fleet Energy Use and GHG Calculations				
		Gas (gals)	Diesel gals)		
Department	ICLEI Category	2018	2018	Gas (MT)	Diesel (MT)
Fleet	Vehicle Fleet	34,949	28,447	295	611
TOTALS		34,949	28,447	295	611

Section 4:	GHG Emissions By Administrative Function	
	GHG Emissions (MTCO2e)	
	2018	Average
All Municipal Operations	1418.98	1418.98
Wastewater facilities	35.0	35.0
Administration facilities	511.5	511.5
Vehicle fleet	611.1	611.1
Streetlights and traffic signals	38.7	38.7
Water delivery facilities	222.7	222.7

GHG Emission % By Function		
Wastewater facilities	2%	2%
Administration facilities	36%	36%
Vehicle fleet	43%	43%
Streetlights and traffic signals	3%	3%
Water delivery facilities	16%	16%



Narrative Description of the Municipal GHG Inventory

EXECUTIVE SUMMARY

The Village of Croton-on-Hudson (Croton) continues its decade-long efforts to find ways to cut its greenhouse gas (GHG) emissions. To assess its progress, it updated its prior (2009) GHG inventory.

To do so, we collected all Scope 1 and Scope 2 municipal emissions data (e.g., electricity, fuels) and, with the assistance of Climate Action Associates, Inc., developed the ICLEI-based spreadsheet and charts seen above.

Boiling down the results showed the following:

- despite increases and changes to facilities, equipment, and operations, our measured emissions dropped by 15% relative to our 2009 inventory

- most of that reduction was due to electrical efficiency measures (e.g., LED interior and street lighting) and replacement of old equipment and facilities; those loads now account for about 36% of our GHG

- as seen in our prior inventory, the largest single contributor (43%) of GHG remains our municipal vehicle fleet

- similarly, our single largest electrical consumer remains the water supply pumps in our drinking water utility, accounting for about 16% of total emissions

As technology and opportunities arise, we look forward to using them to reduce emission levels. Electrical consumption of the water system was recently reduced due to installation of variable speed drives (VSD) on the pumps and changes in water rates and billing. Fuel consumption by vehicles was recently reduced slightly by replacement of two gasoline-driven cars by electric vehicles, but too late to impact the data used in this analysis.

We look forward to seeing the full impact of those recent efforts in our next GHG inventory. A more detailed description of changes occurring since our earlier inventory may be found below under “Results” and in our updated 2019 Climate Action Plan at the beginning of this document.

METHODOLOGY

Approach

Data was collected on all electric, natural gas, fuel oil, gasoline, propane, and diesel accounts for 2018. This process took several months and stretched into 2019 due to the time lag in getting it from vendors, formatting it for use in the above spreadsheet, and checking all numbers against both annual benchmarking data and our 2009 municipal GHG inventory. To that end, we appreciate the assistance provided by Jim Yienger of Climate Action Associates, Inc. and use of its ICLEI-based spreadsheet.

Scopes

As per the requirements of DEC's CSC program, this inventory covers Scopes 1 and 2. While a full inventory would include all three emission scopes, we found that the difficulty and time demands for accurately determining our Scope 3 emissions (e.g., waste management, materials usage) in our 2009 inventory were not in line with our present abilities..

In the past, we found that net Scope 3 emissions were also quite low due to the fact that all of Croton's trash is subject to mandatory separation and recycling, with other trash being incinerated in the Waste-To-Energy (WTE) facility at nearby Charles Point. Doing so yielded a GHG credit that cancelled most GHG from our other Scope 3 sources.

To better understand the Scope 3 carbon sequestration capability of the many acres of Village-owned forest land (not previously assessed), we used iTreeTools software from the National Forest Service. Doing so yielded a surprisingly large GHG credit, amounting to nearly half our total municipal carbon footprint. Until we are able to better refine that number (a process we expect to complete in 2020), it was felt that including such Scope 3 data in this inventory might inadvertently underestimate our municipal footprint, and create confusion regarding next steps for reducing it.

Methods

As described above, we used calculation-based procedures rather than attempting to measure actual carbon dioxide and other GHG gases. The Climate Action Associates spreadsheet utilized the standard ICLEI-based emission factors and the eGrid subregion value (NPCC NYCW) for electricity delivered in the Consolidated Edison territory. As such, the basic formulas involved:

Energy source unit (e.g., kWh, gallons, therms) X appropriate emission factor = GHG emissions

Results of GHG Reduction Efforts

We were happy to see a verified net 15% drop in actual GHG compared to our 2009 inventory. Much of this could be ascribed to reductions in electricity consumption due to:

- conversion of all street, parking lot, park, and traffic lights to LED

- conversion of all interior fluorescent lighting in the Village's five buildings to LED (which included addition of bi-level stairwell lighting and occupancy sensors)

- all of the large water supply pumps received variable speed drives (VSD) which reduced power consumption. Water consumption (and thus electricity for water pumping) followed a switch to quarterly water billing and increased rates for commercial customers.

Other contributors to our GHG reduction involved:

- closing the old Department of Public Works (DPW) maintenance facility at the Croton-Harmon train station, and its replacement with the new facility on Yorktown Road. Its up-to-date HVAC and lighting systems significantly reduced DPW facility energy consumption.

- conversion of the Municipal Building's boiler from oil to dual fuel allowed a switch to natural gas (with oil as a resiliency backup) and removal of its underground oil tank.

Our net GHG reduction occurred even with the acquisition of the Emergency Medical Service (EMS) house, which added electric, fuel oil, and propane consumption.

Due to those efforts, our buildings now account for only about 16% and outdoor lighting only about 3% of our total GHG.

At 43% or our total GHG, the largest single contributor of GHG remains our vehicle fleet: garbage trucks, park and road maintenance vehicles, public safety, and administrative cars. In 2019, two of the gasoline-driven cars were replaced with electric vehicles (EV). We look forward to the replacement of two police cars with hybrid units in early 2020. As EV technology continues to evolve and improve, we look forward to switching out many gasoline-driven pickup trucks (which account for the lion's share of fuel consumption) with plug-in electric models.

At 36% of our total GHG, the largest single consumer of electricity remains our water supply pumps. As the supplier of nearly all drinking water in the Village, we continue to look for ways to dispatch and operate the system to minimize its electric operating costs while maintaining the quality of that essential service. We were recently successful in getting all utility electric meters on those pumps (and our wastewater pumps) replaced with smart meters that will provide 15-minute interval data. Combined with similar time-based data for system-wide water pressure, we are looking forward to assessing options for further cutting power use and cost.

Conclusion

Our 2018 municipal GHG inventory offers verification of our GHG reduction efforts, and points us toward other steps that may be taken to further reduce it. We look forward to deploying new technologies (e.g., EV trucks) as they become available and affordable.

Further details on our GHG reduction programs and efforts may be found in our 2019 Climate Action Plan at the beginning of this document.

We are presently developing ways to use municipal resources and facilities (e.g. rooftops and parking lots) to expand community solar programs. While the use of that power will reduce our community (not municipal) GHG inventory, we nevertheless see it as part of our overall effort to mitigate climate change.