Prepared by the ***Potsdam Climate Smart Communities Task Force***

February 2021

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Village of Potsdam

Municipal Operations GHG Inventory

2017 – 2020

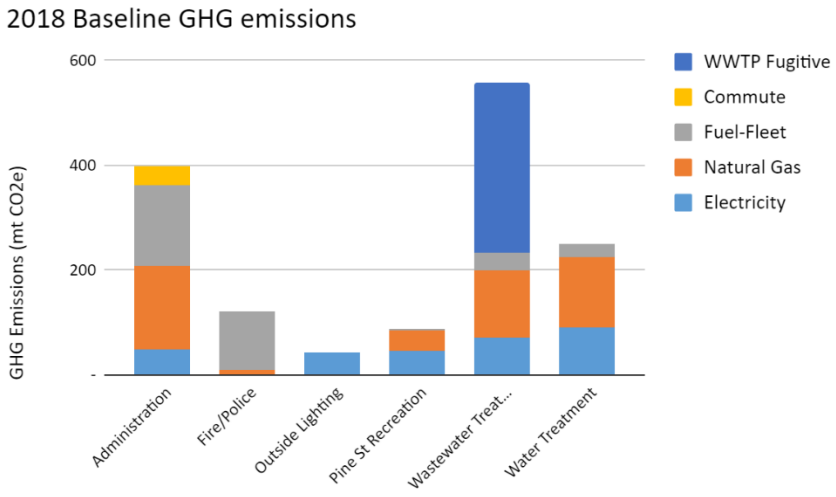
Contents

Executive Summary

In October, 2017, the Village of Potsdam passed a resolution that recognizes the imminent threat from our changing climate and resolved to better understand and mitigate the Village's contributions to greenhouse gas (GHG) emissions. This resolution was the Village's first step to register as a NYSDEC Climate Smart Community (CSC). The twelve-point pledge elements (PE) defined by the CSC program include requirements to complete an inventory of GHG emissions associated with municipal operations. Completing this inventory will increase our eligibility for state funding for actions to support our CSC activities and is a foundational step toward effective action to reduce the Village's climate impacts.

Greenhouse gas emissions for 2018 provide a baseline to track the efficacy of future efforts to reduce energy use and GHG emissions (1,453 metric tons carbon dioxide equivalents (mt CO_2e)). Natural gas for heating comprises the largest contribution to the Village's GHG emissions (32%), followed by fuel for fleet vehicles (23%) and electricity (20%). There is a large amount of uncertainty with fugitive emissions of methane and nitrous oxide from the wastewater treatment plant (WWTP). The activities that contribute most to these emissions include treatment of water and wastewater and operation of the Civic Center building. There have not been any substantive changes in these emissions across the four years analyzed, except for higher natural gas use and associated emissions in colder years (2018 and 2019).

Year	GHG Emissions (mt CO2e)
2017	1405
2018	**1453**
2019	1477
2020	1365



The GHG inventory identified several areas of significant emissions and, thus, room for improvement. Based on these findings, including the uncertainty in some areas, the Potsdam CSC Task Force recommends several general steps to reduce utility use (and expense) and GHG emissions.

- Explore transition to village-owned LED street lights.
- Explore transition to electric vehicles as fleet vehicles are replaced.
- Make the east hydropower plant operational and register it in the NYGATS system to help the Village to transition to renewable electricity.
- Explore *Community Choice Aggregation* or contracts for other local renewable electricity supply as a means for also providing electricity from renewable resources.
- Explore additional energy efficiency (electricity and heat) in the Civic Center, Pine St. Arena and DPW buildings.
- Improve understanding of the ice operations at Pine St. Arena and develop a plan for upgrading this facility.
- Study peak loads for all facilities with high loads and create a plan to reduce excess demand charges.
- Evaluate opportunities to increase the feed to the anaerobic digester at the WWTP to increase biogas production and displace natural gas.

Many of these recommendations will provide the basis for a Climate Action Plan, which is also required for CSC credits and grant funding.

Introduction

In October, 2017, the Village of Potsdam passed a resolution that recognizes the imminent threat from our changing climate and resolved to better understand and mitigate the Village's contributions to greenhouse gas (GHG) emissions. This resolution was the Village's first step to register as a NYSDEC Climate Smart Community (CSC). The CSC program provides a set of elements to help local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The Village officially registered with the CSC program in March 2018 and is currently working to become certified. Details about the CSC program are available at https://climatesmart.ny.gov/.

The twelve-point pledge elements (PE) defined by the CSC program include requirements to complete an inventory of GHG emissions associated with municipal operations and the community at large. GHG inventories helps us understand activities that contribute most to our GHG emissions and provides a basis for developing a climate action plan (CAP). There are four components in ***PE2: Inventory emissions, set goals, and plan for climate action***

- **Government Operations GHG Inventory**
- Community GHG Inventory
- Government Operations Climate Action Plan
- Community Action plan

This report represents the first of these, the Government Operations GHG Inventory. Completing this inventory will increase our eligibility for state funding for actions to support our CSC activities. The inventory is also a foundational step toward effective action to reduce the Villages climate impacts. GHG inventories provide the data needed to set realistic goals and track progress toward reducing operating costs, energy use, and emissions.[1] Completing an inventory requires that the municipal activities generating GHG emissions be identified, their annual quantities be determined from municipal records and their overall contribution to GHGs be quantified. The inventory presented here uses standard GHG inventory protocols.

GHG emissions included in an inventory are defined as:

- Scope 1: Direct emissions from municipal activities (e.g., combustion of natural gas (NG) for building heating, combustion of gasoline and diesel fuel in village-owned vehicles, and fugitive emissions from the wastewater treatment plant)
- Scope 2: Indirect emissions associated with the purchase of electricity for use by village activities but generated elsewhere
- Scope 3: Indirect emissions associated with the materials we purchase and associated travel (e.g., commuting)

For convenience to the reader, this report is organized by first identifying activities and then presenting the results of the assessment. Details of the data sources and methodology to estimate GHG emissions are integrated into a set of appendices for completeness

Village Government Activities Contributing to GHG Emissions

The Village of Potsdam New York owns and operates several buildings, a small municipal airport, a recreation center that includes an ice arena, and water and wastewater treatment facilities (Figure 1). The village also pays for lighting and signals for our streets, sidewalks, and crosswalks. The K-12 school district and Canton-Potsdam Hospital are not considered to be within the scope of the municipal activities. The GHG inventory includes all utility meters that are paid through the Village office. The primary activities included in this assessment include electricity, natural gas and transportation fuels are used in the following activities:

[1] NYSDEC CSC website PE2: Government Operations GHG Inventory https://climatesmart.ny.gov/actions-certification/actions/#open/action/6 (accessed 12/6/20)

- The Civic Center building at 2 Park Street includes municipal offices and meeting rooms, the museum and library. One electric meter covers this facility and the adjacent fire station. The building also has a natural gas-fired steam boiler that provides heat for the Civic Center and the fire department. The fire department has an additional natural gas meter for its kitchen. The Civic Center building is also adjacent to a newer building that is owned by the independently operated Potsdam Volunteer Rescue Squad, which also houses the police station. Electricity and heating of the police station itself is not included in this analysis.

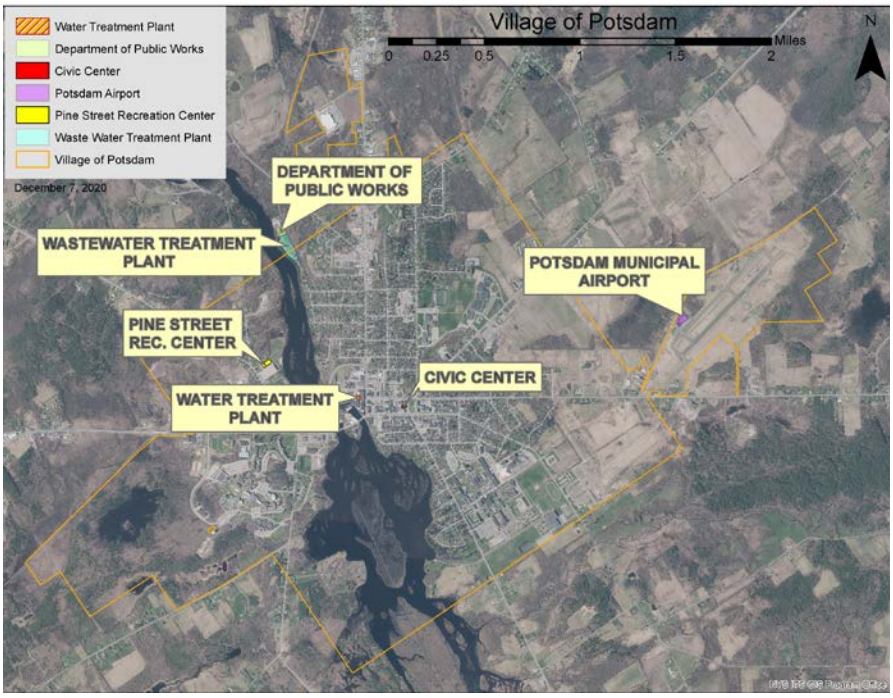


Figure 1. Primary Village of Potsdam Municipal facilities
(map prepared by Ben Goodrich, Clarkson University Civil Engrg student BS CE'22)

- The Department of Public Works has a building at 120 Cherry St that includes both electricity and natural gas utilities. The DPW also buys diesel and gasoline fuel in bulk. All village maintenance and fleet vehicles fill their fuel tanks from the DPW's storage tanks.
- The Pine Street recreation center includes an ice arena and beach for community recreation for residents of both the Village and Town of Potsdam. This facility uses natural gas for heating and hot water, electricity and refrigerants for maintaining the ice for skating and hockey. Refrigerant use is not included in this inventory.
- The Potsdam Airport on Rt 11B provides service for private planes and a few cargo businesses (UPS, LTI). Electricity is used for the hanger building, SRE building and the beacon that identifies the runway for landing planes. Liquid propone gas (LPG) is used to heat the SRE building.
- Municipal water is provided to all residents and commercial /institutional buildings within the Village water district. The water filtration plant at 5 Raymond Street uses both electricity and natural gas for the traditional coagulation and direct filtration treatment processes. Smaller amounts of electricity are also used at the water tower that provides adequate head for proper flow to all utility users.
- Wastewater treatment services are also provided to all residents and commercial facilities within the Village of Potsdam. The wastewater treatment plant (WWTP) on lower Cherry Street consumes electricity and natural gas in its buildings and treatment processes. Additional electricity is used at pump stations throughout the village that assure flow of sewerage to the WWTP. The organic matter in the sewerage is aerobically degraded by an activated sludge process. Anaerobic digestion and a screw press are used to further degrade some of the remaining organic matter into biogas and stabilize and dewater the sludge before landfilling or land application. The biogas helps to displace some of the natural gas used for heating. These processes also contribute to fugitive emissions of methane (CH_4) and nitrous oxide (N_2O), which are also greenhouse gases

Emissions from these facilities and activities for calendar years 2017 through 2020 are included in this report. The 2018 data provide a baseline to assess current and future energy reduction activities.

Appendix A includes a detailed list of these activities and the associated electricity and natural gas account numbers. Natural Gas was purchased and delivered by Embridge/St. Lawrence Gas until that business was purchased by Liberty Utilities in 2019. The account numbers change in this transaction (Oct 2020). Electricity for most of the buildings is purchased from National Grid. A few of the facilities purchase electricity from Constellation New Energy, a third-party supplier. For the purposes of this inventory, the electricity generation and associated emissions are estimated by the NY

Upstate sub-grid region, which includes all generation resources in the state north of ~Westchester County NY. The use of the regional electricity emissions is a standard practice for GHG inventories.

The NYUP region boasts the lowest average GHG emissions for electricity generation in the entire United States. Our region includes a lot of hydropower (34.6%) and nuclear power (31.3%) generation with no GHG emissions (Figure 2). In contrast, the US as a whole generates a majority (63%) of its electricity from fossil fuels. The net result is that electricity generation in the NYUP region results in only 0.115 kg CO_2/kWh generated, which is 73% less than the national average of 0.430 kg/kWh.

In reality, the electricity purchased by both National Grid and Constellation Energy are not as clean as the NYUP region as a whole. This complexity is not included here due to uncertainties in the information available for the electricity resources purchased by these suppliers. The analysis also does not include the hydroelectric power generated by the Village's east hydropower plant, in part because it has not been functional for most of the period of this inventory and, in part, because it is not registered with the NYGATS system[2] as a renewable energy resource.

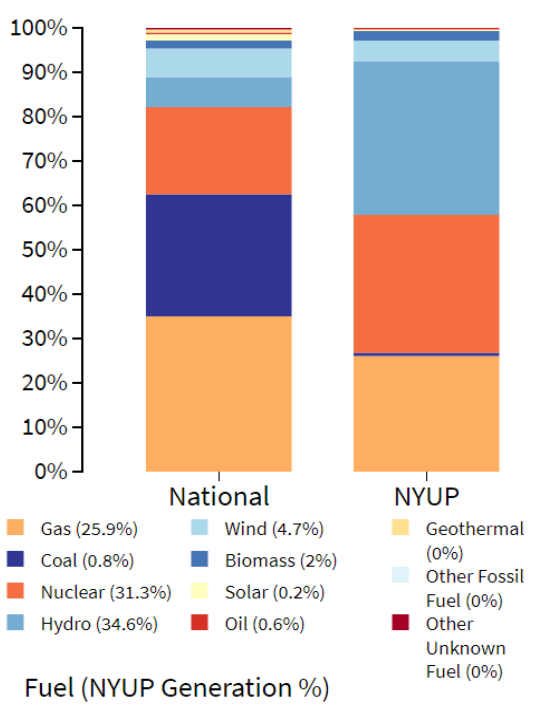


Figure 2. Energy resources used to generate electricity in the NYUP region compared to the national average
https://www.epa.gov/egrid/power-profiler#/NYUP

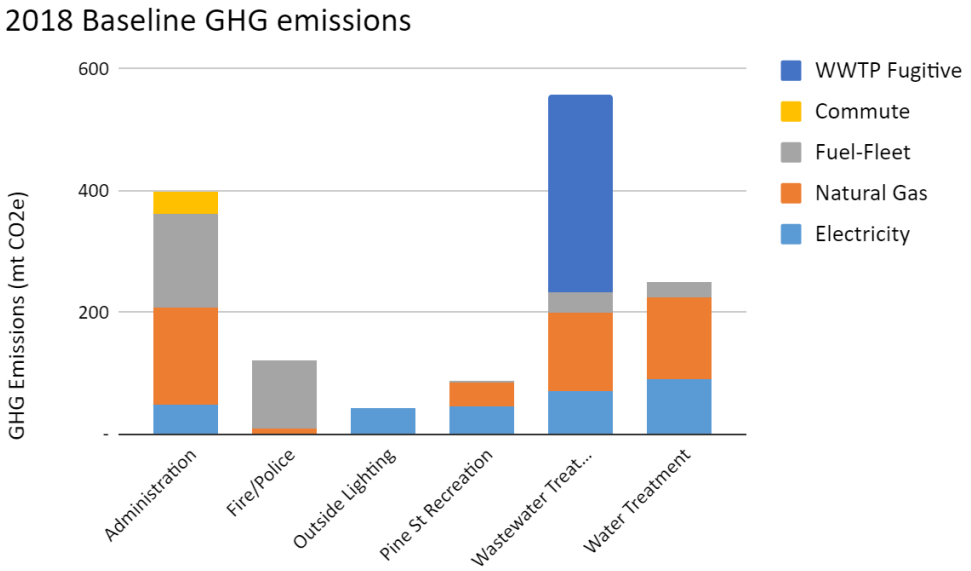
Results

Overview - Baseline GHG Emissions

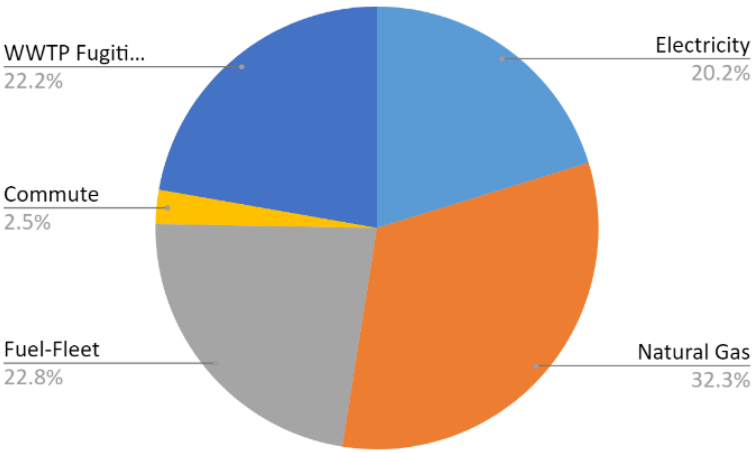
Greenhouse gas emissions for 2018 provide a baseline to track the efficacy of future efforts to reduce energy use and GHG emissions. The results are broken into results by the type of emission source (e.g., electricity, natural gas) and type of activity. Figure 3 presents the overall 2018 GHG emissions for the Village of Potsdam municipality. The total emissions are estimated to be 1,453 metric tons carbon dioxide equivalents (mt CO_2e). Carbon dioxide equivalents are used in GHG inventories to sum contributions from a variety of different greenhouse gases. Carbon dioxide is the primary GHG associated with the Village's operations since so much of the emissions stem from the combustion of fossil fuels. Values for all GHG emissions and all activities are included in Appendix B.

The total reported GHG emissions for the Village of Potsdam's operations includes 323 mt CO_2e as fugitive emissions from the wastewater treatment processes. This value has a substantial level of uncertainty. Further details explaining these emissions are included in a later section.

[2] NYGATS, New York Generation Attribute Tracking System https://www.nyserda.ny.gov/All-Programs/Programs/NYGATS/



a)



b)

Figure 3. Summary of estimated 2018 GHG emissions for the Village of Potsdam municipal operations: a) breakdown by activity and source and b) breakdown by source (same data, mt CO2e) (the administration activity includes DPW and the airport; no data for LPG use were available for this baseline year. 2020 data though show it to be negligible relative to these other emissions)

Several general observations about these data include (additional details are included in later sections and the Appendices):

- Natural gas for heating across all facilities contributes most to the Village operation GHG emissions (32%)
  - Wastewater treatment plant: 29% (of emissions from natural gas use)
  - Water treatment plant: 27%
  - Civic Center: 24%
- Gasoline and diesel fuel used in Village vehicle use are the second largest contributor (23% of total emissions)
  - DPW and misc. Village cars 47% (of emissions from fuel use)
  - Police 30%
- Electricity use contributes 20% of the Village's GHG emissions
  - Water supply 30% (of emissions from electricity use)
  - Wastewater treatment 27%
  - Outside lighting 15%
  - Pine St. Recreation 15%

- Fugitive emissions from the wastewater treatment processes could be a significant factor (est. 22%), though there is substantial uncertainty in these emissions at this time.
- Commuting does not contribute very much to the total (<3%)
- As a separate activity, the airport does not contribute substantially to the emissions (4% electricity)

Four-year record of GHG emissions

GHG emissions have not changed substantially over the four-year period of this analysis (Figure 4, Table 1). The years 2018 and 2019 were colder than 2017 and 2020, leading to greater use of natural gas and increased GHG emissions those two years. The increased heating demand was assessed using heating degree days (HDD) with a 65 °F basis[3].

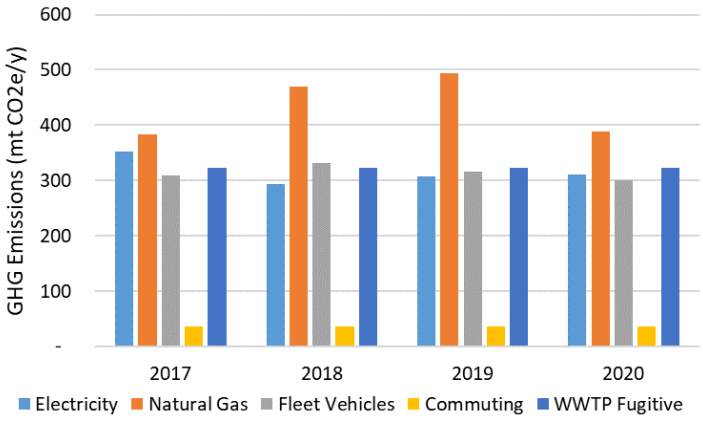


Figure 4. Four-year summary of GHG emissions

Table 1. Total annual GHG Emissions

Year	GHG Emissions (mt CO2e)	HDD (°F)
2017	1405	7351
2018	1453	7823
2019	1477	8255
2020	1365	7200

Details: Electricity Use

Electricity use data for meters paid by the Village were documented from 2017 through 2020. Data were obtained from direct downloads from the National Grid portal and review of monthly bills paid by the Village. Data from the top six 2017 electric energy consumers were identified. These meters consumed 93.1% of the total electricity.

Water Treatment	27-31%	Acct # 259140102
Sewage Treatment	24-27%	2130208107
Pine Street Rec.	15-18%	6497652101
Outside lighting	13-14%	275293108
Civic Center	5-7%	7844996100
DPW building	2%	5550208104

In later years, only these meters were tracked and “all others” were approximated by assuming that they still consume 6.9% of the total. Figure 5 illustrates that the Village municipal operations consume approximately 2,500 MWh electric energy per year. Additional meter level data are included in Appendix C. There have not been any substantial changes in this consumption over the four years evaluated here.

[3] See explanation of HDD at the National Weather Service site - https://www.weather.gov/key/climate_heat_cool

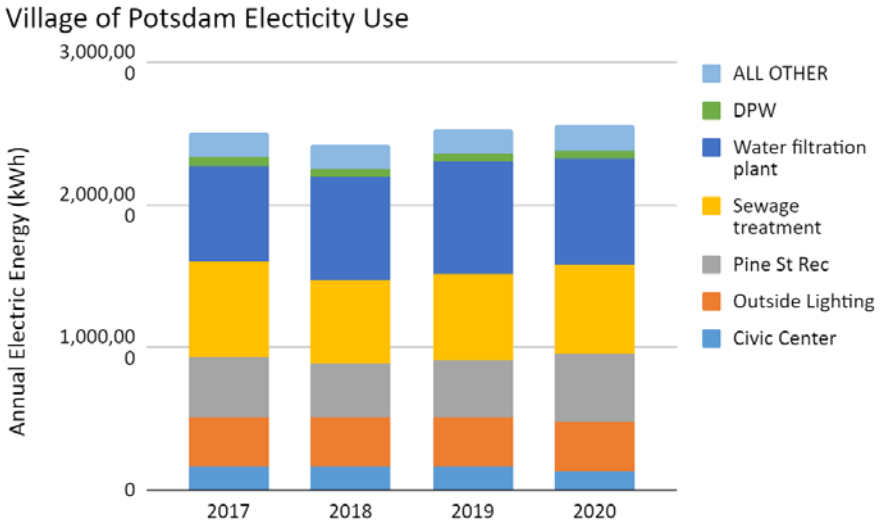


Figure 5. Electricity use by major activities associated with Village operations.

The water and wastewater treatment plants consume approximately 55% of the total electricity[4]. These facilities are typically a high consumer of electricity for pumps, blowers, lights and other process equipment. Renovations to the WWTP occurred over much of this period with completion in 2019. The renovations included many energy efficiency upgrades, including a changeover to LED lighting and the replacement of the 1968-model mechanical aeration mixers with variable frequency drives. VFDs control how the motors start up, which reduces the initial big power draw, and then they control the speed of the motors to increase energy efficiency. The electricity savings associated with these renovations are not yet apparent in the annual electricity consumption. The con-current construction and operations over these years may have masked any net benefits between before and after renovation. Continued evaluation will be required.

Among the various electric meters associated with the Village operations, the largest users pay both for the electric energy consumed as well as a demand charge (and a whole bunch of fees). Demand charges are based on the highest power consumption (kW) in any one 15 minute period during the billing period. The water and wastewater treatment plants both pay high demand charges (Figure 6). Energy efficiency measures and operational changes can reduce both the energy use and demand charges.

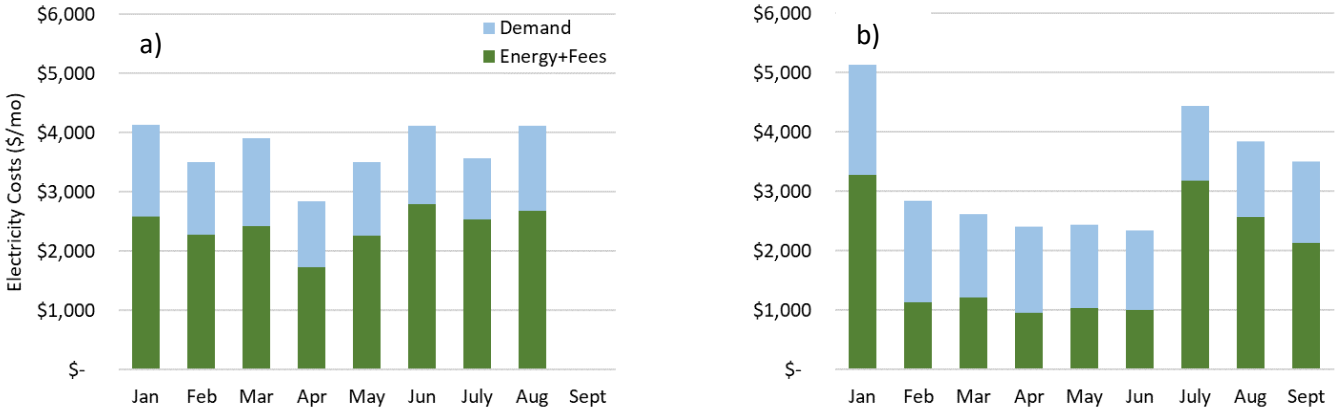


Figure 6. Electricity costs for the (a) wastewater and (b) water treatment plants suggest high fees for power demand (2020)

[4] As a comparison: W/WWTPs in the City of Beacon consumed 78% of their municipal electricity consumption

The Village's streetlights are predominantly owned by National Grid. The Village pays for the electricity consumed (20-40 MWh per month over the course of the year) and a facility charge for the street light poles. There are two major expenses associated with this arrangement: 1) National Grid street lights are not high efficiency LED bulbs, and 2) the Village pays a monthly fee of approximately $5,650 per month (almost $68k per year) in facilities fees. This doubles (January) or triples (May, June) the monthly National Grid bill for outside lighting (Figure 7).

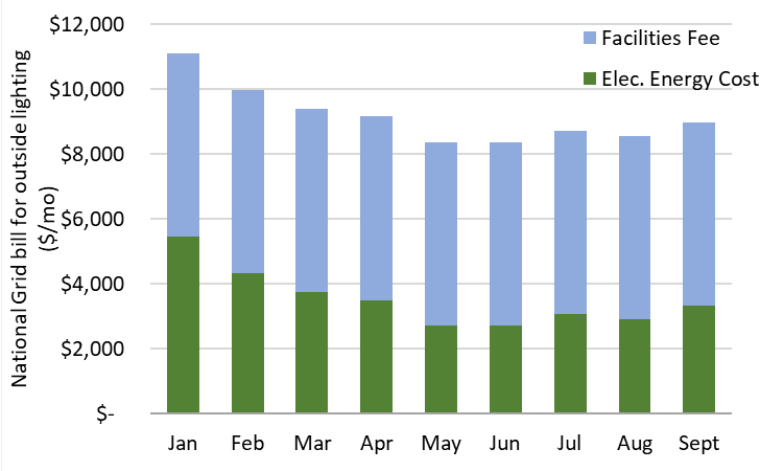


Figure 7. National Grid fees for electricity and facilities fees for outdoor lighting (2020)

For all electricity use, the overall emission factor to estimate GHG emissions for the NYUP sub grid was used as a direct multiplier (0.115 mt CO2e/MWh generated) with acknowledgement of the 4.88% loss of electric energy through the transmission from generator to user.

$$GHG\ Emissions\ \frac{mt\ CO2e}{year} = Elec\ Energy\ \frac{MWh\ delivered}{year}\ x\ 0.115\ \frac{mt\ CO2e}{MWh\ generated}\ x\ \frac{1}{(1-0.0488)}\ \frac{MWh\ generated}{MWh\ delivered}$$

Details Natural Gas Use

Natural gas (NG) use in Village operations totals 72,000 to 92,000 therms per year (Figure 8 and details in Appendix D). The water and wastewater facilities consume most of this natural gas (56-60%). There was substantial increase in the use of NG at the WWTP in recent years (25 to 33 thousand therms) compared to 2017 (20 thousand therms). The renovations were intended to reduce NG use through the installation of a single high efficiency dual-fuel boiler and the use of biogas from the upgraded anaerobic digester to displace some of the fossil natural gas consumption. That benefit is not yet apparent, in part because of the colder temperatures, especially in 2019. In 2020, the meters on the boiler for the primary sludge and dewatering buildings and the primary sludge pumping building heat were both high consumers of natural gas.

The value of the biogas generated by the anaerobic digester is limited. For example, in November 2020, the WWTP reported that they used 289 ccf NG (100 cubic feet), which was supplemented by 3.7 ccf from the digester (an additional 0.32 ccf were flared). It is clear that the biogas generated is minimal relative to the NG required to operate the WWTP.

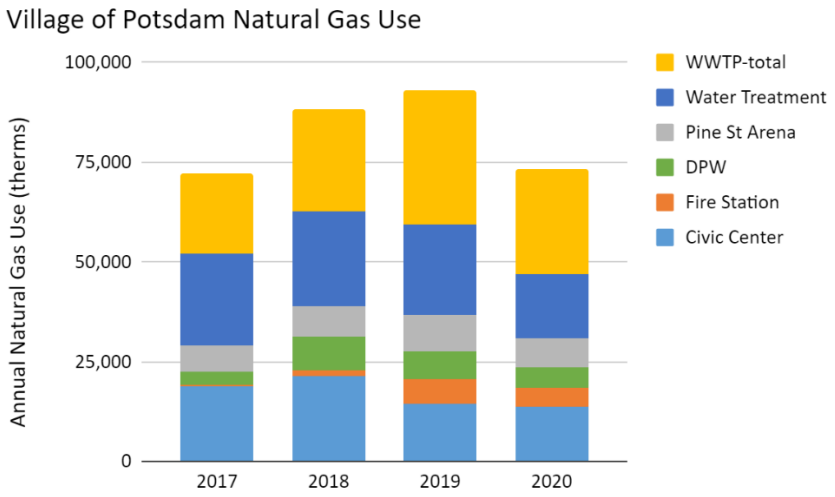


Figure 8. Natural gas use in Village operations

GHG emissions from natural gas combustion were estimated using the EPA standard emission factor for stationary combustion (0.00531mt CO2e/therm).

Details: Gasoline and Diesel Fuel Use

The Village Department of Public Works (DPW) maintains large storage tanks for gasoline and diesel fuel for refueling of all village-owned vehicles. This centralized approach facilitates collection and understanding of fuel use data. Village vehicles use an average of 32,500 gallons per year (gasoline+diesel) with diesel fuel contributing slightly over half (50-55%) of that consumption (Figure 9). From a GHG emission perspective, however, the higher emission factor for diesel fuel (0.0102 metric tons CO2e/gallon) than gasoline (0.00878 metric tons CO2e/gallon) results in the diesel fuel use contributing 54-59% of the GHG emissions.

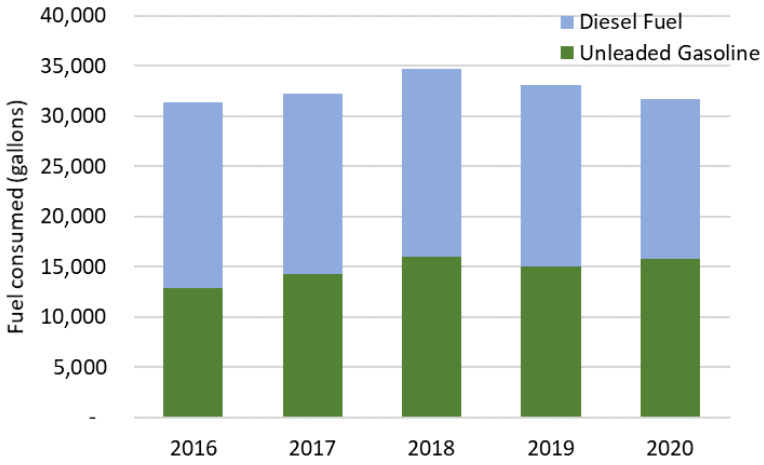


Figure 9. Transportation fuel consumed in village vehicles (note: due to a DPW computer crash and loss of data, data for six months of 2019 is approximated based on data from prior years)

Fuel use by specific operating unit was available for just 2020. As shown in Figure 10, the DPW consumes the most fuel (47%) with significant additional use by the police (30%). DPW use is dominated by maintenance (65% of DPW use; 30% of total) with snow removal (17%) and street cleaning (15%) also contributing to the DPW fuel consumption.

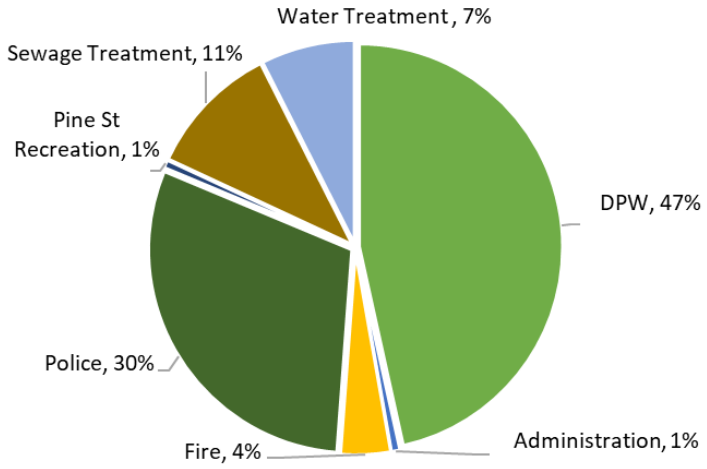


Figure 10. Distribution of transportation fuel use in the village of Potsdam, 2020

Details: Fugitive Emissions at the Wastewater Treatment Plant

In the process of degrading the organic matter in sewerage, bacterial processes create nitrous oxide (N_2O) and methane (CH_4) as degradation products. Both of these gases are potent GHGs. Methane is generally considered to be 25 times stronger in its contributions to the greenhouse effect than carbon dioxide (25 kg CO2e/kg CH4) and nitrous oxide 298 times as potent (298 kg CO2e/kg N2O)

The research work by Parravicini et al (2016)[5] assessed emissions from WWTPs in Austria, including systems that are similar to Potsdam WWTP (Figure 11). Results of this paper and others suggest that fugitive emissions from WWTPs can be substantial, but are highly variable based on the treatment processes and treatment effectiveness. For the analysis and values included here, overall emission factors for the type of treatment system used in Potsdam that are based on the population served were used. This paper suggests the following emission factors:

N2O: 15.5 kg CO2e/PE/year (based on 77% removal of nitrogen in the activated sludge process)

CH4: 9.5 kg CO2e/PE/year

The population served (PE) is variable by season in Potsdam due to the significant impact of student populations on the wastewater generation. The population used here was based on census data (8991 for 2019 and 30 weeks/year of full student population (6820 students in 2017), resulting in an average total of approximately 13,000 people served by the WWTP

Detailed data for and modeling of the treatment plant could result in more accurate values for these emissions. Improved treatment of nitrogen by WWTP processes would substantially reduce the N_2O emissions.

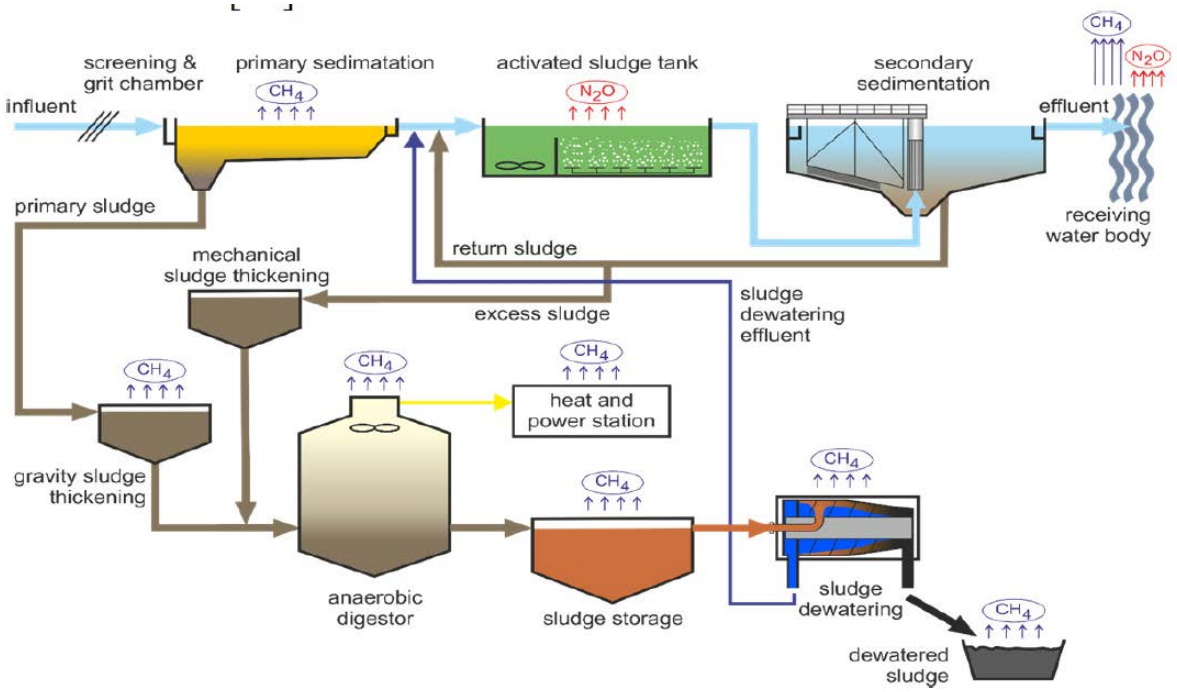


Figure 11. Schematic representation of an activated sludge / anaerobic digestion WWTP shows sources of fugitive emissions of methane and nitrous oxide[5]

Details: Commuting emissions

A survey of commuting habits among village employees was conducted in 2019 and assumed to represent other years. Employees were asked to identify the length of their daily commute, typical fuel economy for their type of vehicle (e.g., 25-30 MPG (e.g., Subaru Legacy/Outback, Ford Focus FWD)), and comment on their commuting habits. It was assumed that all employees work 47 weeks per year (235 workdays per year). A factor of 70% was applied for individuals who suggested that they carpool to account for reduced number of days that they drive independently. 28 employees responded to the survey. Six of these indicate that they carpool and one indicated that they walk 40% of the time.

Results show that they each typically consume 147 gallons of gasoline for commuting, leading to a total of just over 4,000 gallons. The average fuel economy (21.2 MPG) is lower than the national average, but consistent with the higher number of maintenance employees who often drive pick-up trucks (10 individuals described their vehicles as the category "15-20 MPG (e.g., Ford F150; Honda Odyssey, Chevy Suburban, GMC Yukon)". The average daily commute was 16.6 miles round trip.

Given the low total GHG emissions associated with this activity (36 mt CO2e/y), it will not be tracked in the on-going annual GHG inventory report.

Next Steps

The GHG inventory has identified several areas of significant emissions and, thus, room for improvement. Based on these findings, including the uncertainty in some areas, the Potsdam CSC Task Force recommends the following next steps.

- Explore transition to village-owned LED street lights to reduce GHG emissions and save monthly electricity and facility use fees
- Explore transition to electric vehicles as vehicles are replaced to reduce emissions from Village-owned vehicles

[5] Parravicini et al., (2016). Greenhouse Gas Emissions from Wastewater Treatment Plants. *Energy Procedia*, 97: 246-253. Doi:10.1016/j.egypro.2016.10.067

- Make the east hydropower plant operational and register it (and the west hydropower plant) in the NYGATS system to help the Village to transition to renewable electricity. Evaluate the annual electricity generation of the hydropower plant against current electricity consumption to assess the relationship between hydropower supply and village electricity consumption for further electrification of vehicles or buildings
- Explore ***Community Choice Aggregation***[6] or other direct electricity purchases from local generators as an additional means for providing electricity from renewable resources.
- Explore additional energy efficiency (electricity and heat) in the Civic Center, Pine St. Arena and DPW buildings, including an assessment of peak loads and mechanisms to reduce the demand charges and or change them to non-demand meters.
- Develop better understanding of operation of refrigeration/ice maintenance for Pine St. Arena ice rink system to develop plan for upgrading this facility that is consistent with existing equipment life span and mitigation of release of GHG while simultaneously improving energy efficiency.
- Study electricity use and demand in the water treatment plant and WWTP to reduce emissions and excessive demand charges
- Evaluate the longer-term use of natural gas and electricity at the WWTP (10-y past) to increase confidence in findings and quantify savings associated with the recent renovations. Compare the savings to that predicted in the renovation design reports to identify possible actions to reduce energy use
- Evaluate opportunities to increase feed to the anaerobic digester to increase biogas production and displace natural gas.

Many of these recommendations provide the basis for a Climate Action Plan, which is also required for CSC credits and grant funding.

Acknowledgements

This report has had a number of contributors from the Potsdam CSC Task Force. Susan Powers, David Bradford and Rich Wong were the initial committee. Susan Powers completed the final analysis and assessment. Lori Queor, Village clerk, provided access to utility use bills, Jim Corbett provided transportation fuel consumption data and James Blackmore helped to understand utility use at the WWTP. Students from Clarkson University supported the generation of Figure 1 and exploration of emissions from the WWTP.

[6] NYSERDA, Clean Energy Communities Community Choice Aggregation. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/How-It-Works/Toolkits/Community-Choice-Aggregation

Appendix A: Details for activities included in the GHG inventory, Village of Potsdam

Activity	Electricity Acct. Name	Electricity Acct. #	Natural Gas (6) Location	Natural Gas (6) Old Acct. #	Transportation Fuel	Refrigerants	Other / fugitive	Comments
Village Admin.	Civic Center	7844996100	2 Park St 40 Main Fire	19043-10310 40444-40081		(1)		Police electric not included - shared with rescue squad Civic Center, 2 Park St. includes museum (both elec. and NG) and library (just NG)
Streetlights and signals	Ives Park Ped. Ives Park Gazebo Outside Lighting unmetered Lighting Flashing Beacon Crosswalk Beacon	62552194 122552103 275293108 373097002 2243052004 2786941028	---		---	---		
Highway dept.	DPW	5550208104	15 Cherry St	21715-11534	Diesel, Gasoline	(1)		Fuel use at DPW facilities also supports village admin, fire, police
Water Supply	Water filtration plant water tower	259140102 7144846003	5 Raymond St	20359-10984	---	---		
Wastewater Services	pump station pump station Sewage treatment pump station pump station pump station sewage	430208101 660126107 2130208107 4819090101 6437652103 7273804100 7724256005	Riverside Dr Cherry St F Primary Sludge Lower Cherry Admin	21716-11535 41604-40346 20516-53357 20516-53358	---	---	(2)	 new NG meter after renovation new NG meter after renovation
Recreation	Rec Center	6497652101	Pine St Arena	20232-10912		used for chiller		Not estimated
Airport	Airport Beacon Airport SRE Building Conv. Hanger Bldg. Airport NBD BEA	220126107 479027006 2053127005 5721362102	--- Diamond Propane	 114363021	(5)	(1)		 no NG use at airport??
Solid waste	---		---		---	---	(3)	
Employee commuting	---		---		Gasoline			
Employee travel	---		---		(4)	---		

(1) Refrigerant use for general bldgs. neglected. Is considered de minimis in the Local Government Operations Protocol (LGOP)
(2) Fugitive emissions expected - CH4 and N2O. Work required to improve these estimates
(3) Solid waste to facility with LFGTE system - minimal fugitive (and negative emission factor)
(4) Travel minimal, mostly local with personal cars (fleet vehicles included in DPW). Considered de minimis because < commute
(5) Fuel use at airport allocated to customers who buy fuel. No fuel used by Village <check about fuel for snow removal and landscaping>
(6) there are new account numbers for NG meters as of October2020

Appendix B: Summary of all utility/fuel use and GHG emissions

Electricity	Electricity use (kWh/y)				GHG Emissions (mtCO2e/y)			
	2017	2018	2019	2020	2017	2018	2019	2020
Civic Center	165,760	172,160	163,680	134,320	23.3	20.9	19.9	16.3
Outside Lighting	344,343	344,445	344,241	344,157	48.4	41.8	41.8	41.8
Pine St Rec	421,056	369,408	405,696	477,120	59.2	44.8	49.2	57.9
Sewage treatment	671,520	584,820	601,600	623,360	94.5	71.0	73.0	75.6
Water filtration plant	676,538	730,486	788,961	746,424	95.2	88.6	95.7	90.6
DPW	55,889	54,527	57,636	62,493	7.9	6.6	7.0	7.6
ALL OTHER	173,690	167,794	175,677	177,615	24.4	20.4	21.3	21.5
TOTAL	**2,508,796**	**2,423,640**	**2,537,491**	**2,565,489**	**353**	**294**	**308**	**311**

Natural Gas	Natural Gas Use (therms/y)				GHG Emissions (mtCO2e/y)			
	2017	2018	2019	2020	2017	2018	2019	2020
Civic Center	18,805	21,431	14,521	13,843	99.9	113.8	77.1	73.5
Fire Station	205	1,426	6,068	4,463	1.1	7.6	32.2	23.7
DPW	3,613	8,438	7,058	5,283	19.2	44.8	37.5	28.1
Pine St Arena	6,302	7,479	9,046	7,287	33.5	39.7	48.0	38.7
Water Treatment	22,985	23,967	22,550	15,926	122.1	127.3	119.7	84.6
WWTP-total	20,374	25,570	33,679	26,485	108.2	135.8	178.8	140.6
TOTAL	**72,284**	**88,311**	**92,920**	**73,287**	**384**	**469**	**493**	**389**

Propane (LPG)	LPG use (gallons)				GHG Emissions (mtCO2e/y)			
	2017	2018	2019	2020	2017	2018	2019	2020
Airport SRE Bldg				830				4.7

Fleet Vehicles	Fuel used (gallons/y)							
	2017	2018	2019	2020	2017	2018	2019	2020
Gasoline	14,309	15,978	15,073	15,822	125.63	140.29	132.34	138.92
Diesel Fuel	17,943	18,698	18,063	15,887	183.02	190.72	184.24	162.04
TOTAL					**309**	**331**	**317**	**301**

Commuting	Fuel used (gallons/y) (assumes all personal vehicles use gasoline)							
	2017	2018	2019	2020	2017	2018	2019	2020
Gasoline		4,111				36.10		
TOTAL		**4,111**				**36**	**36**	**36**

Wastewater Treatment	(note - high degree of uncertainty)							
					2017	2018	2019	2020
Fugitive N2O						200		
Fugitive CH4						123		
TOTAL						**323**	**323**	**323**
Village Total Emissions						**1,453**	**1,477**	**1,365**

Appendix C: Details of electricity use

Annual total electricity use for primary village metes is included in Table C.1. Fairly complete data for all meters were collected for six months of 2016 and 2017 (see additional data for 2016 and 2017 in Table C.2). These data were used to identify the primary meters associated with over 90% of the total electricity consumed for Village operations. Fewer electric bills were reviewed in 2018-2020 to focus on key information. Values for all other meters were estimated based on each of their percentages from 2017. Cells with gray highlights were also estimated due to missing data.

Table C.1. Annual electricity use for primary electric meters

	2016 6 mo.		2017 Annual		2018 Annual		2019 Annual		2020 Annual	
	kWh	% total	kWh	% total	kWh	% total	kWh	% total	kWh	% total
Civic Center	111,440	7.7%	165,760	6.6%	172,160	7.1%	163,680	6.5%	134,320	5.2%
Outside Lighting	172,141	11.9%	344,343	13.7%	344,445	14.2%	344,241	13.6%	344,157	13.4%
Pine St Rec	221,184	15.2%	421,056	16.8%	369,408	15.2%	405,696	16.0%	477,120	18.6%
Sewage treatment	424,080	29.2%	671,520	26.8%	584,820	24.1%	601,600	23.7%	623,360	24.3%
Water filtration plant	426,905	29.4%	676,538	27.0%	730,486	30.1%	788,961	31.1%	746,424	29.1%
DPW	25,660	1.8%	55,889	2.2%	54,527	2.2%	57,636	2.3%	62,493	2.4%
ALL OTHER	69,111	4.8%	173,690	6.9%	167,794	6.9%	175,677	6.9%	177,615	6.9%
Grand Total	1,450,521		2,508,796		2,423,640		2,537,491		2,565,489	

Table C.2. Electricity use for meters included as “all others” in Table C.1

	2016 6 mo.		2017 Annual		2018 Annual
	kWh	% total	kWh	% total	kWh
Airport Beacon	5225	0.4%	11920	0.5%	12828
Airport NBD BEA	973	0.1%	2923	0.1%	
Airport SRE Building	3797	0.3%	9302	0.4%	
Conv. Hanger Bldg.	26711	1.8%	65591	2.6%	
Crosswalk Beacon	272	0.0%	460	0.0%	
Flashing Beacon		0.0%	70	0.0%	
Ives Park Gazebo	4050	0.3%	7375	0.3%	7497
Ives Park Ped.	1464	0.1%	2579	0.1%	
pump station	14928	1.0%	36463	1.5%	
sewage	6658	0.5%	27517	1.1%	28268
unmetered Lighting	3046	0.2%	5398	0.2%	
water tower	1987	0.1%	4092	0.2%	

Appendix D: Details of natural gas use

Monthly natural gas use was totaled for each meter to provide annual use starting in 2017. There are several meters at the WWTP, with some transition among the meters during construction. Note that there is an apparently unused meter at the "Potsdam Hydro Plant", 5 Raymond Street for which the Village is paying $27/month to maintain.

	NG use (therms)							
Building / Activity	2017	2018	2019	2020	meter #	new acct #	old acct #	Address
Civic Center	18,805	21,431	14,521	13,843	SL15083	44681074-44477256	19043-10310	2 Park St
Fire Station	205	1,426	6,068	4,463	SL12160	44686514-44481222	40444-40081	40 Main Fire
DPW	3,613	8,438	7,058	5,283	SL11585	44682084-44477889	21715-11534	Cherry St Bldg (DPW)
Pine St Arena	6,302	7,479	9,046	7,287	SL20138004	44681575-44477585	20232-10912	Pine St Arena
Water Treatment	22,985	23,967	22,550	15,926	SL13193	44681638-44477629	20359-10984	
WWTP-total	20,374	25,570	33,679	26,485	(see details below)			
Potsdam Hydro Plant			0	0	SL20102014	44681637-44477628	20358-10983	5 Raymond St (aka Potsdam Hydro Plant)
TOTAL	72,284	88,311	92,920	73,287				

Details for the WWTP total included above:

Boiler	20,353	24,308	26,720	12,487	SL12928	44682085-44477890	21716-11535	15 Lower Cherry (WWTP) aka Riverside Dr
Old meter	21	30					41604-40346	Cherry St F
Primary Sludge		679	2905	2804	SL12162	44691768-44477653	20516-53357	Primary Sludge pumping station heat
WWTP Admin		553	3993	10450	SL201300207	44691769-44477653	20516-53358	Lower Cherry Admin
Digester Ignitor			2	679	SL20102080	44692113-44477653	20516-53718	Lower Cherry St Ignitor
Generator			59	65	SL20122268	44692080-44477653	20516-53682	Cnty Lane Generator