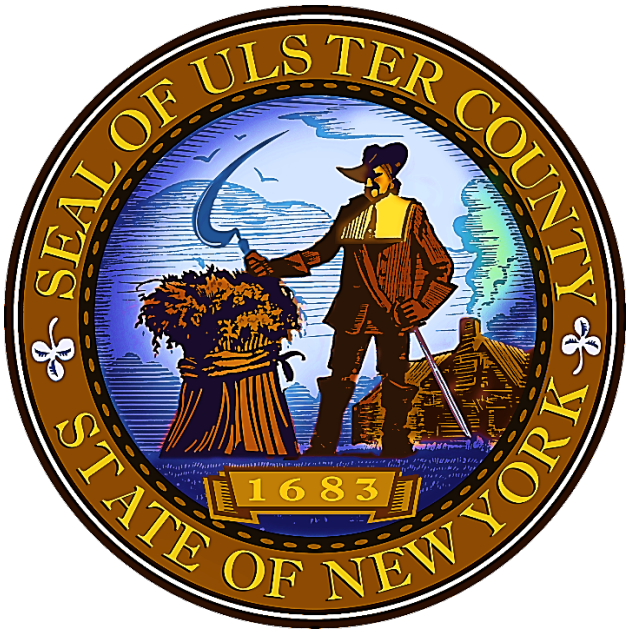

2017
BUILDING BENCHMARKING REPORT

1. Introduction

Background

Executive Order Number 1 of 2016 commits Ulster County to decreasing greenhouse gas emissions associated with its operations (through conservation, efficiency, and on-site renewable generation) by 25% by 2025 and 80% by 2050 using the County's 2012 greenhouse gas emission inventory as a baseline. A baseline greenhouse gas (GHG) inventory conducted in 2012 for Ulster County government operations evaluated the energy use and emissions associated with the county vehicle fleet, employee commuting to and from the workplace, and the operations of county owned or occupied facilities. That inventory showed that the buildings & facilities sector alone accounted for 43% of all greenhouse gas emissions, totaling 5,804 metric tons of CO_2e.[1] Ulster County's building portfolio is substantial and includes 42 properties with gross floor area totaling nearly 950,000 square feet.

Building energy use benchmarking is critical to the achievement of greenhouse gas emissions goals. First, it allows the comparison of weather-normalized energy metrics across time periods to assess the impact of building efficiency improvements. Second, it allows comparison to a national standard (EPA ENERGY STAR®) and average commercial building performance across the United States—helping to identify outlier properties within the Ulster County portfolio, communicate the opportunity for energy efficiency, and focus energy management attention. One of the main goals of this benchmarking report is to consistently track and monitor the energy use and emissions associated with the County's building inventory in order to better inform both operations and planning activities to improve efficiency and reduce costs as possible.

Reporting Requirements

Resolution No. 447 of 2016 established a policy for annual public reporting of building energy consumption for Ulster County-owned or occupied buildings with a gross floor area equal to or greater than 1000 square feet. This policy requires public reporting of the following building performance metrics no later than September 1st each year:

- Energy Use Intensity (EUI)
- Weather Normalized Source EUI
- Annual Greenhouse Gas emissions
- Energy performance score (when available)

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[1] Reference Ulster County Greenhouse Gas Emissions Report, VHB, 2012. Available here: http://ulstercountyny.gov/environment/energy-sustainability

Methodology

Ulster County benchmarks building energy using the EPA's ENERGY STAR Portfolio Manager application, an online tool that tracks energy, water and waste consumption and calculates a variety of energy performance metrics as well as greenhouse gas emissions. Energy use and emissions data from 2012 has been used as a baseline value for benchmarking purposes, to show progress toward the Ulster County greenhouse gas reduction goal.

Electric Vehicle (EV) Charging Stations: Several Ulster County properties have EV charging stations installed on site and configured to draw energy from the building electrical panel. Without any adjustments, this energy would be included in the building energy use metrics and would indicate excess usage as the energy is used to power vehicles and not the building systems. However, using data from the ChargePoint® EV charging station reporting system, this electricity usage can be deducted from the building usage to report an accurate building use total. This electricity usage is reported in the Ulster County Green Fleet report annually.

Fixed Usage Area Lighting: Ten Ulster County properties are billed monthly for utility-provided outdoor area lighting, which is reflected as "*Flat Charge"* usage on the utility invoice for the account, and is billed by Central Hudson according to Service Classification Number 5 rates. This usage is included in the metrics for each property with lighting installed. The cost includes fees for the rental of the lighting equipment from Central Hudson. Where applicable, a property use-type of parking and parking area estimate are input in the Portfolio Manager system for improved accuracy in calculating energy use metrics.

Factors and Conversions: The EPA Portfolio Manager application converts all fuel types to a common energy unit—thousands of British thermal units (kBtu)—to allow for aggregation to calculate whole-building energy use. To do so, the application the following thermal conversion assumptions below. Additionally, this conversion allows comparison of relative magnitudes of energy use across fuel types as shown in Chart 1 below.

Table 1: Conversion Factors[2]

Fuel Type	Input Unit	Conversion Factor
Electricity (Grid Purchase)	kWh	3.412 kBtu/kWh
Natural Gas	CCF	102.6 kBtu/CCF
Propane	Gallons	92 kBtu/gal
Fuel Oil (No. 2)	Gallons	138 kBtu/gal
Diesel	Gallons	138 kBtu/gal
Wood	Tons (US)	17,480 kBtu/ton

[2] Retrieved from: https://portfoliomanager.energystar.gov/pdf/reference/Thermal%20Conversions.pdf

2. Building Energy Use

Ulster County uses the following energy sources for heating, cooling and powering its buildings. Usage and cost data is obtained from the vendor through web applications or data requests.

Table 2: Energy Types and Data Sources - 2017

Energy Type	Supplier and Data Source
Electricity	Delivery: Central Hudson (web access) NYSEG (web access & customer service) Supply: Direct Energy (web access)
Natural Gas	Delivery: Central Hudson (web access) Supply: Direct Energy (web access)
Fuel Oil	Heritagenergy, Inc. (web access)
Propane	Heritagenergy, Inc. (web access)

Currently, energy-use metrics for benchmarking are not calculated for properties where Ulster County leases office space in facilities without sub-metering. In these cases, energy use data for the leased spaces cannot be separated from whole building energy use. Table 3 contains a listing of these spaces as of December 31st, 2017.

Table 3: Leased Space without Metered Energy Use Data - 2017

Property	Address	UC Leased Space (sq. ft.)	Total Building Space (sq. ft.)
Board of Elections	284 Wall Street, Kingston, NY	3,566	27,137
Public Defender	280 Wall Street, Kingston, NY	4,050	27,137
Department of Health - W.I.C.	230 Aaron Court, Kingston, NY	2,917	9,000
Probation Department	124 Main Street, New Paltz, NY	1,308	4,920
Office of Employment and Training	521 Boice's Lane, Kingston, NY	10,287	98,464
Sheriff's Substation Wallkill	1500 Rt. 208, Wallkill, NY	711	3,840
Sheriff's Substation Mt. Tremper	146-152 Mt. Pleasant Rd, Mt. Tremper, NY	2,004	N/A
Sheriff's Substation Shandaken	Town Hall, Rt. 28	N/A	N/A
Sheriff's Substation Port Ewen	Esopus Town Hall, Salem St.	N/A	N/A

The following Charts 1 and 2 show the relative proportions of total energy and cost contributed by each of the energy types used in Ulster County buildings in 2017.

Chart 1: 2017 Total Building Energy Usage by Type (kBtu)

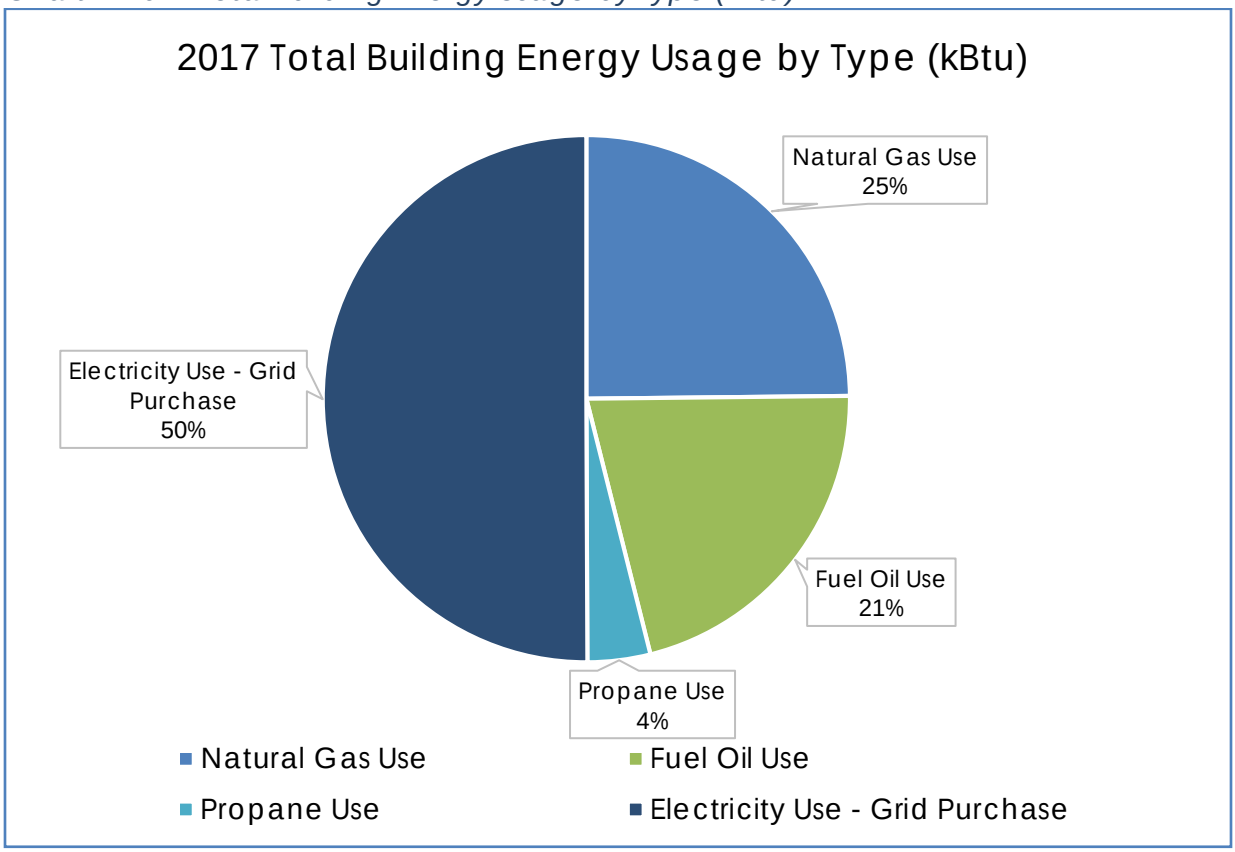


Chart 2: 2017 Total Building Energy Cost by Energy Type ($)

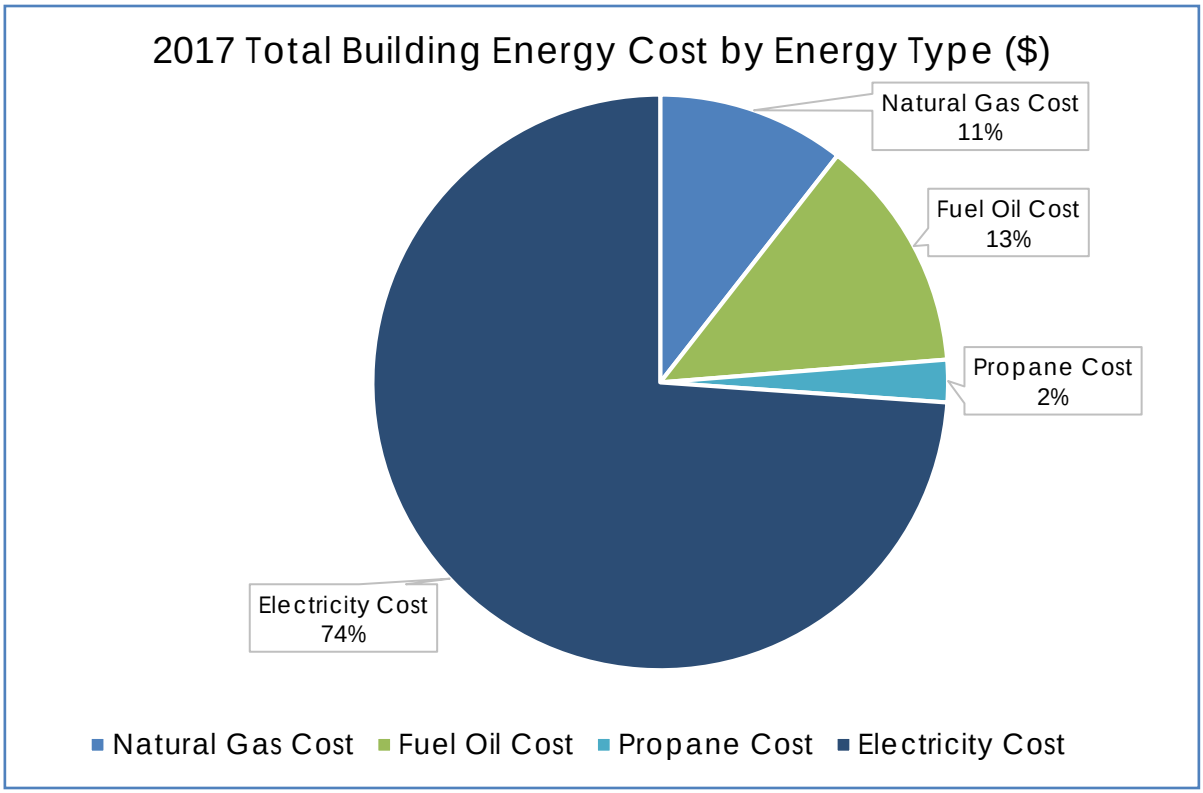


Table 4 shows the quantities and total cost of each energy type purchased in 2017.

Table 4: 2017 Quantity Purchased and Cost by Type

Energy Type	Purchased Energy (kBtu)	Cost
Natural Gas	20,579,287	$183,480
Fuel Oil	17,617,839	$229,006
Propane	3,189,463	$41,335
Electricity	41,490,208	$1,284,075
Totals	**82,876,798**	**$1,737,896**

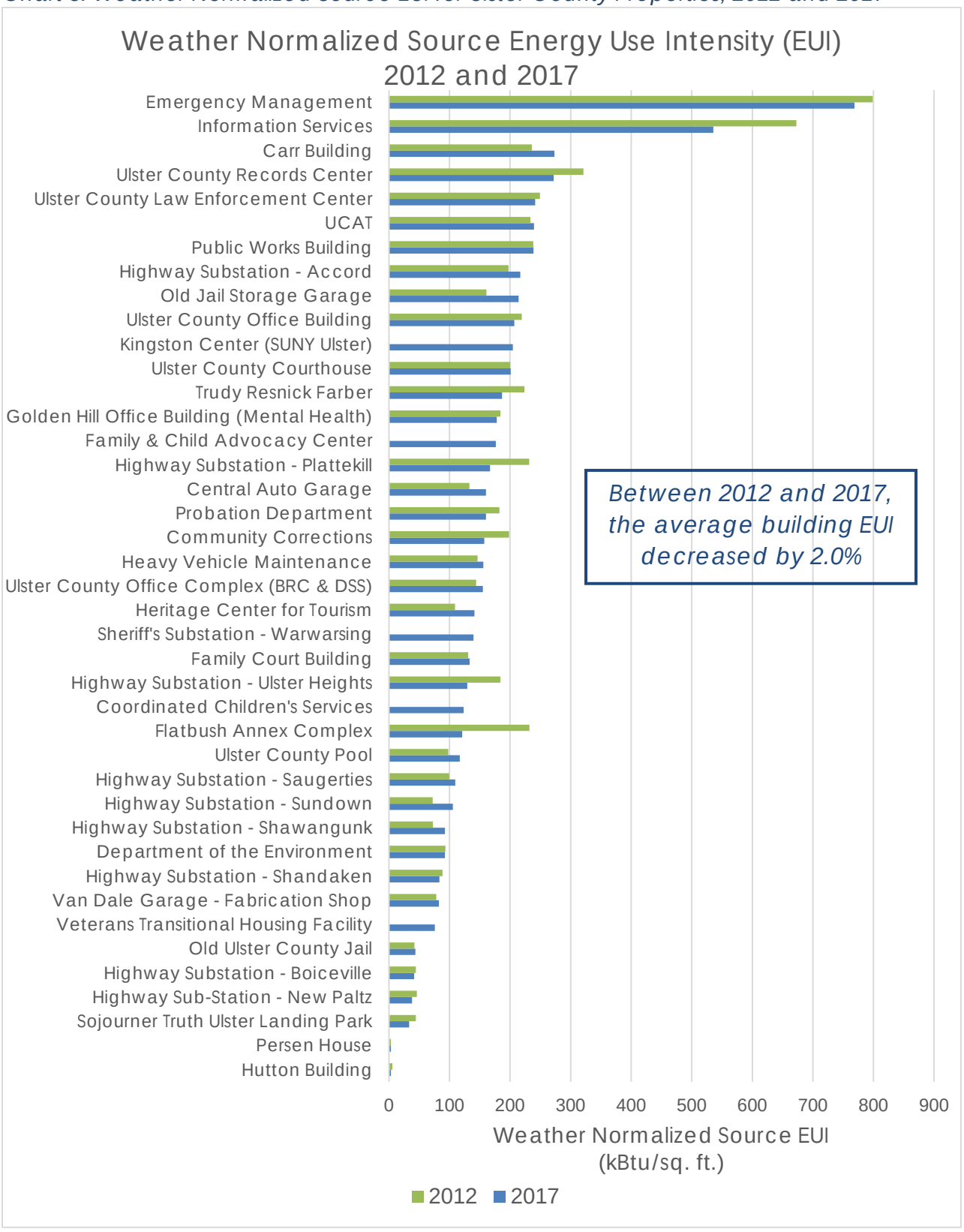
Table 5 shows the energy usage and cost at each of the Ulster County properties reported. An energy cost of $0 indicates that Ulster County owns the property, but does not pay the utility bills.

Table 5: 2017 Energy Consumption and Cost at Ulster County Buildings

Property	Gross Floor Area (sq. ft.)	2017 Site Energy Use (kBtu)	2017 Energy Cost ($)	Energy Cost Intensity ($/sq. ft.)
Carr Building	3,560	583,830	$10,538	$2.96
Central Auto Garage	5,000	506,145	$10,386	$2.08
Community Corrections	7,700	571,399	$14,012	$1.82
Coordinated Children's Services	1,100	75,411	$2,102	$1.91
Department of the Environment	4,229	240,674	$4,350	$1.03
Emergency Management	2,130	577,095	$16,826	$7.90
Family & Child Advocacy Center	2,400	187,849	$5,706	$2.38
Family Court Building	25,282	1,779,810	$41,414	$1.64
Flatbush Annex Complex	24,836	1,348,197	$29,657	$1.19
Golden Hill Office Building (Mental Health)	39,600	2,688,253	$67,270	$1.70
Heavy Vehicle Maintenance	35,000	3,858,195	$49,210	$1.41
Heritage Center for Tourism	2,087	172,493	$0	$0.00
Highway Substation - Accord	2,324	141,013	$6,183	$2.66
Highway Substation - Boiceville	13,690	334,271	$7,552	$0.55
Highway Sub-Station - New Paltz	13,697	214,905	$5,968	$0.44
Highway Substation - Plattekill	2,265	202,577	$5,880	$2.60
Highway Substation - Saugerties	5,223	395,153	$8,007	$1.53
Highway Substation - Shandaken	5,364	317,583	$5,750	$1.07
Highway Substation - Shawangunk	4,433	275,069	$6,055	$1.37
Highway Substation - Sundown	4,984	385,212	$6,472	$1.30
Highway Substation - Ulster Heights	3,545	314,036	$5,397	$1.52
Hutton Building	3,386	3,459	$527	$0.16
Information Services	12,525	2,424,046	$63,500	$5.07
Kingston Center (SUNY Ulster)	29,900	3,249,429	$0	$0.00
Old Jail Storage Garage	5,000	315,662	$12,293	$2.46
Old Ulster County Jail	53,391	698,986	$21,409	$0.40
Persen House	6,405	6,625	$619	$0.10
Probation Department	17,594	1,433,617	$29,528	$1.68
Public Works Building	8,925	963,100	$24,368	$2.73
Sheriff's Substation - Warwarsing	1,534	121,695	$2,678	$1.75
Sojourner Truth Ulster Landing Park	3,198	82,556	$1,981	$0.62
Trudy Resnick Farber	20,732	2,365,148	$46,511	$2.24
UCAT	23,413	2,576,544	$53,579	$2.29
Ulster County Courthouse	43,650	3,644,996	$90,244	$2.07
Ulster County Law Enforcement Center	277,000	31,289,507	$682,181	$2.46
Ulster County Office Building	62,396	6,026,731	$124,996	$2.00
Ulster County Office Complex (BRC & DSS)	117,977	8,470,701	$179,888	$1.52
Ulster County Pool	7,126	351,212	$10,311	$1.45
Ulster County Records Center	22,550	2,521,911	$60,224	$2.67
Van Dale Garage - Fabrication Shop	15,146	900,935	$18,066	$1.19
Veterans Transitional Housing Facility	6,656	356,789	$6,254	$0.94
Total	**946,953**	**82,972,817**[3]	**$1,737,896**	

[3] This value differs from the Purchased Energy total in Table 4 due to renewable power generated and consumed at Highway Sub-Station - New Paltz.

Chart 3: Weather Normalized Source EUI for Ulster County Properties, 2012 and 2017



3. Renewable Generation

Solar Photovoltaic (PV): Ulster County currently operates the following renewable generation sites:

Table 6: Renewable Generation at Ulster County Properties

Site	System Capacity	Interconnection Type	2017 Energy Generation
New Paltz Substation Salt Shed	30.6 KW	Behind the meter	37,447 kWh

Electricity generation from the New Paltz substation directly reduces the electrical load and usage at the facility – resulting in lower cost and reduced emissions at the site.

The Ulster Landfill site (1.9 MW), planned to come online in April 2018, will apply energy to the account of the Ulster County Law Enforcement Center (UCLEC) through a power purchase agreement and remote net metering arrangement. The generation quantity from the Ulster landfill facility will not affect the building energy use metrics for UCLEC in future reports, but rather will be included in the green power purchasing accounting at all Ulster county electricity usage, reducing the quantity of renewable energy credits (RECs) purchased each year.

4. Greenhouse Gas Emissions

Greenhouse gas emission estimates were calculated using the EPA Portfolio Manager application using the following conversion factors. These factors were applied to the site energy consumption values to calculate annual emissions.

Table 7: EPA Portfolio Manager Greenhouse Gas Emissions Conversion Factors[4]

Fuel Type	Conversion Factor (kg CO2e/MBtu)
Electricity (eGRID Region: NYUP)	48.87
Natural Gas	53.11
Heating Oil (No. 2)	74.21
Propane	64.25

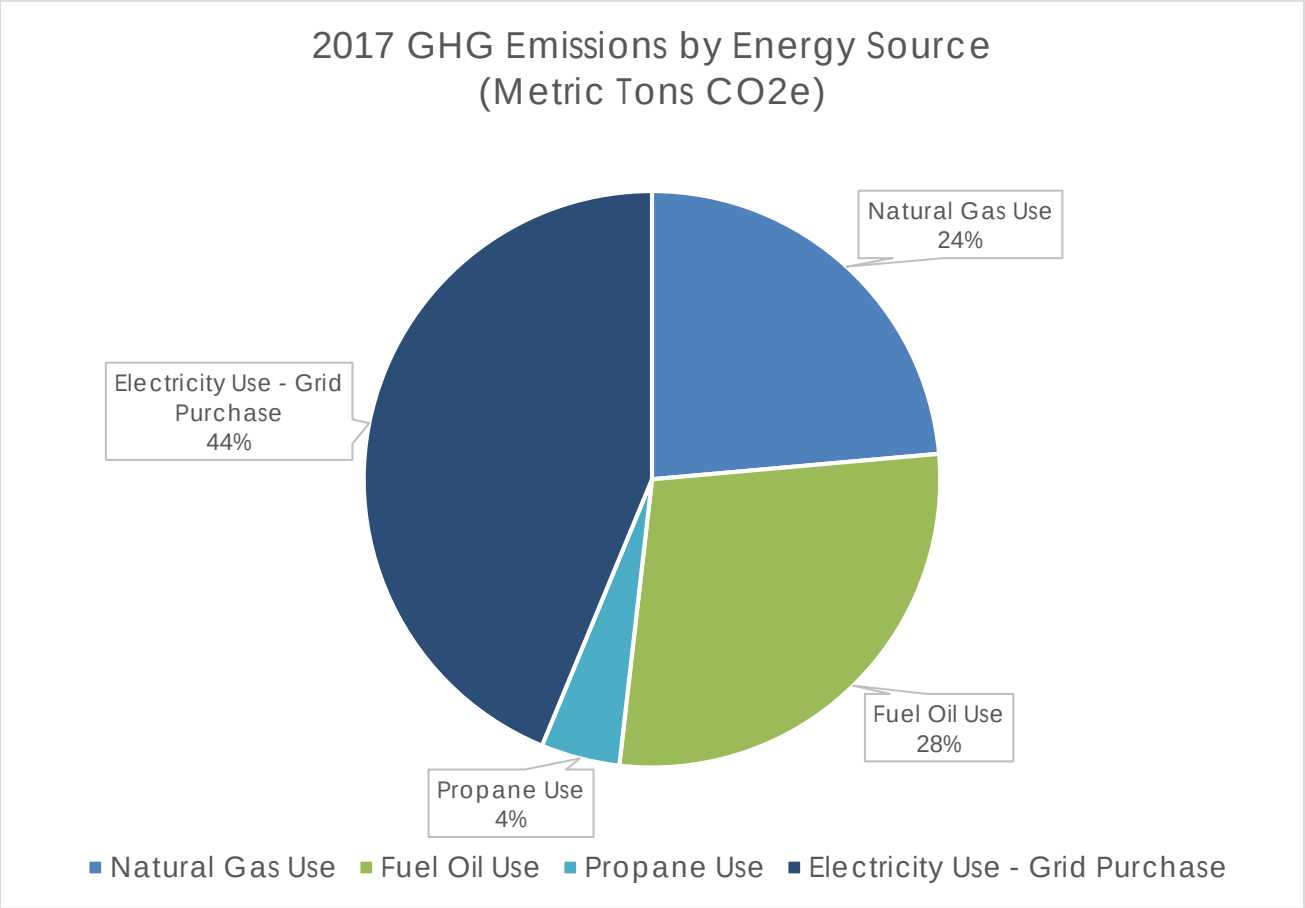
Note: 1 MBtu = 1,000 kBtu

Ulster County offsets 100% of its Scope 1 and 2 emissions through the purchase of Climate Action Reserve carbon credits and Green-e certified renewable energy credits (RECs). To measure progress toward GHG reduction goals and to quantify annual offset credit purchase requirements, this report assumes the absence of emissions offsets.

In 2017, the operation of Ulster County buildings generated 4,637.4 metric tons of CO2e. Chart 4 shows the relative proportions of emissions attributable to each energy source.

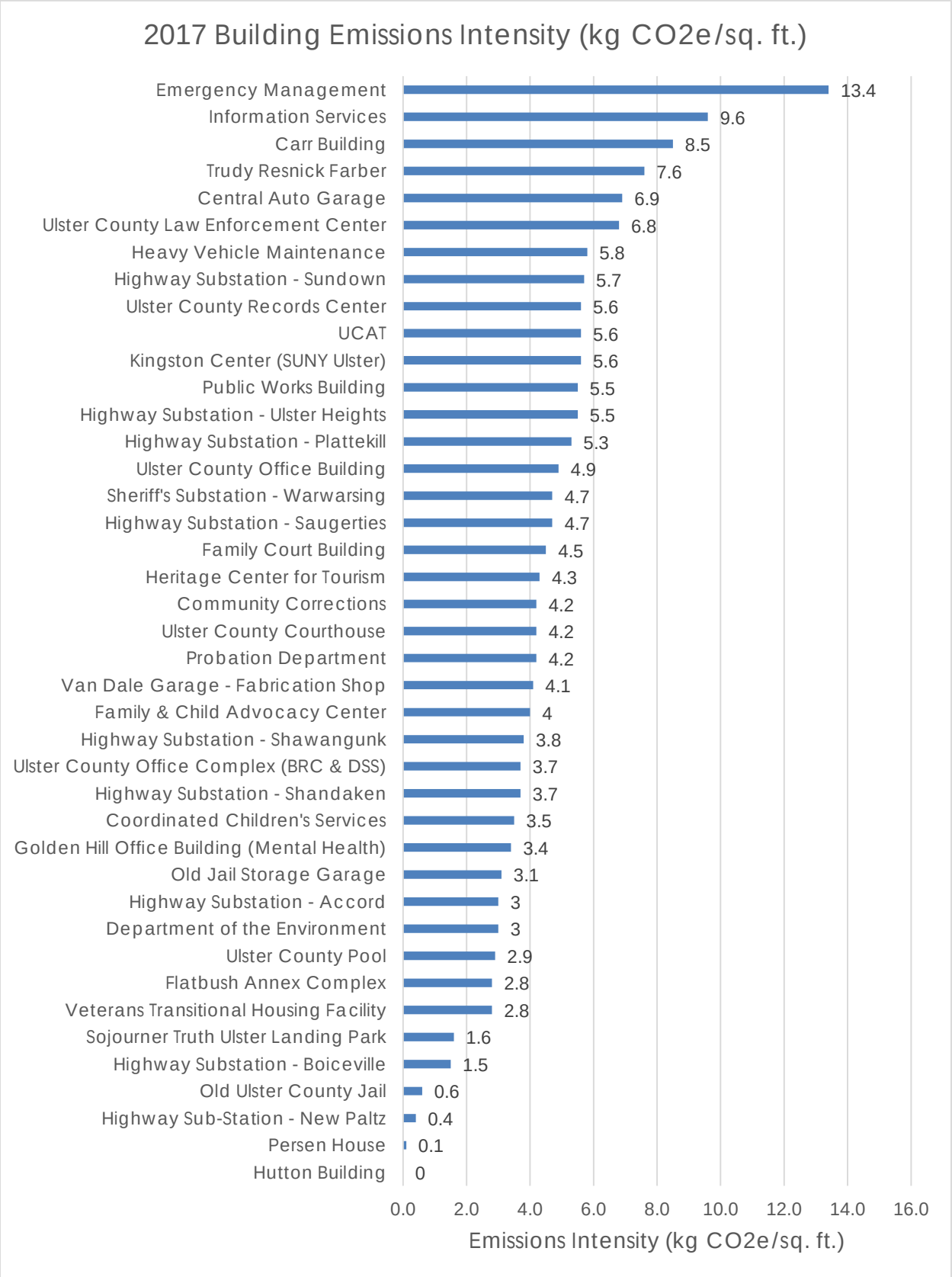
[4] Retrieved from: https://portfoliomanager.energystar.gov/pdf/reference/Emissions.pdf

Chart 4: 2017 Greenhouse Gas Emissions by Energy Source



The following Chart 5 shows the emissions intensity for Ulster County buildings in 2017. Emissions Intensity is the mass of greenhouse gases (carbon dioxide equivalent) emitted per square foot per year for a given property (kg CO2e/sq. ft.). Greenhouse gas emissions intensity is a useful metric for building energy benchmarking as building performance changes with relation to this metric are directly related to achievement of our policy goal for greenhouse gas reduction. This metric captures the true climate cost of various technologies and energy sources by converting the impact to a common ratio. The emissions intensity ratio accounts for the carbon intensity of the local electricity generation mix when compared with other energy sources used in buildings (i.e. fossil fuels for direct combustion).

Chart 5: 2017 Greenhouse Gas Emissions Intensity



Appendices

Appendix A: Energy Performance Metrics

Energy Use Intensity: Energy Use Intensity (EUI) is the primary energy performance metric used by the EPA's ENERGY STAR program. EUI is the energy use per square foot at a property (kBtu/square foot) and is used to compare buildings of different sizes.

Site and Source Energy: The EPA ENERGY STAR® program distinguishes between **site** and **source energy**. **Site energy** is the usage as measured exclusively from the building, which is the quantity recorded in utility bills. **Source energy** accounts for the additional energy expenditures associated with production, transmission, and delivery of the fuel. The source energy metric allows the energy efficiencies of buildings to be compared without imparting a bias based on the type of fuel they consume. National average ratios are used within the EPA ENERGY STAR scoring system to prevent any individual building from being penalized or credited due to the relative efficiency of its energy provider.

National Average Source-Site Ratios used in Portfolio Manager:[5]

Fuel Type	Source-Site Ratio
Electricity (Grid Purchase)	3.14
Electricity (On-site Solar)	1.00
Natural Gas	1.05
Heating Oil (No. 2)	1.01
Propane	1.01

Weather Normalized Energy:[6] Weather normalized energy is the energy a property would have used under average conditions (also referred to as climate normals). In a given year, the weather may be warmer or colder than the building's normal climate; weather normalized energy accounts for this difference. This allows for a better comparison of building performance over time by removing the effect of annual weather variations.

National Median Source EUI:[7] The National Median is a median reference point based on the 2012 Commercial Building Energy Consumption Survey (CBECS) published by the U.S. Energy Information Administration, without any normalization for either weather or operation. The national median is a recommended benchmark for comparison of relative energy performance: 50% of properties perform below the median, and 50%

[5] Retrieved from: https://portfoliomanager.energystar.gov/pdf/reference/Source%20Energy.pdf
[6] More detail available here: https://portfoliomanager.energystar.gov/pdf/reference/Climate%20and%20Weather.pdf
[7] Technical reference here: https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf

perform above the median. The exact way the median is determined depends on the property use and size.

EPA 1-100 ENERGY STAR score: Some buildings can also receive a 1 – 100 ENERGY STAR score. This percentile score, calculated by Portfolio Manager, compares a building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means the building performs better than 75 percent of all similar buildings nationwide — and may be eligible for ENERGY STAR certification**.**

Appendix B: Weather Normalized Energy Usage Trends (Source EUI)

2017 Source EUI Change from 2012 Baseline

Property	2012 Source EUI (kBtu/Sq. Ft)	2017 Source EUI (kBtu/Sq. Ft)	% Change
Carr Building	235.9	273.2	16%
Central Auto Garage	132.8	160.2	21%
Community Corrections	198.2	157.5	-21%
Coordinated Children's Services	-	123.2	N/A
Department of the Environment	93.1	92.3	-1%
Emergency Management	798.9	768.8	-4%
Family & Child Advocacy Center	-	176.5	N/A
Family Court Building	131	133.1	2%
Flatbush Annex Complex	231.9	120.9	-48%
Golden Hill Office Building (Mental Health)	183.8	177.9	-3%
Heavy Vehicle Maintenance	146.4	155.9	6%
Heritage Center for Tourism	109	141.1	29%
Highway Substation - Accord	197.5	217	10%
Highway Substation - Boiceville	44.4	41.5	-7%
Highway Sub-Station - New Paltz	46.2	37.9	-18%
Highway Substation - Plattekill	231.7	167.1	-28%
Highway Substation - Saugerties	99.6	109.4	10%
Highway Substation - Shandaken	88.3	83.4	-6%
Highway Substation - Shawangunk	72.7	92.4	27%
Highway Substation - Sundown	72.3	105.3	46%
Highway Substation - Ulster Heights	183.9	129.3	-30%
Hutton Building	5.5	3.2	-42%
Information Services	672.9	535.7	-20%
Kingston Center (SUNY Ulster)	-	204.4	N/A
Old Jail Storage Garage	161	214.1	33%
Old Ulster County Jail	42.2	43.7	4%
Persen House	3.4	3.2	-6%
Probation Department	182.4	160.2	-12%
Public Works Building	238.2	238.5	0%
Sheriff's Substation - Warwarsing	-	139.4	N/A
Sojourner Truth Ulster Landing Park	44.4	33.2	-25%
Trudy Resnick Farber	223.7	186.6	-17%
UCAT	233.5	239.5	3%
Ulster County Courthouse	200.4	200.9	0%
Ulster County Law Enforcement Center	249.2	241.3	-3%
Ulster County Office Building	219.4	207	-6%
Ulster County Office Complex (BRC & DSS)	144	154.9	8%
Ulster County Pool	97.9	116.9	19%
Ulster County Records Center	321.1	272.1	-15%
Van Dale Garage - Fabrication Shop	78.1	82.6	6%
Veterans Transitional Housing Facility	-	75.8	N/A

Appendix C: Emissions Trends

2017 GHG Emissions Change from 2012 Baseline GHG Inventory

Property	2012 Baseline GHG Emissions (MT CO2e)	2017 GHG Emissions (MT CO2e)	% Change
Carr Building	23.8	30.4	28%
Central Auto Garage	26.2	34.7	32%
Community Corrections	35.4	32.3	-9%
Coordinated Children's Services	-	3.9	N/A
Department of the Environment	12.3	12.5	2%
Emergency Management	27.6	28.6	4%
Family & Child Advocacy Center	-	9.5	N/A
Family Court Building	110.5	113.6	3%
Flatbush Annex Complex	135.3	68.5	-49%
Golden Hill Office Building (Mental Health)	132.2	134.5	2%
Heavy Vehicle Maintenance	186.8	202.9	9%
Heritage Center for Tourism	5.8	9	55%
Highway Substation - Accord	6.1	6.9	13%
Highway Substation - Boiceville	20.3	19.9	-2%
Highway Sub-Station - New Paltz	10.8	5.8	-46%
Highway Substation - Plattekill	19.1	11.9	-38%
Highway Substation - Saugerties	20.2	24.5	21%
Highway Substation - Shandaken	25.3	19.6	-23%
Highway Substation - Shawangunk	15.8	17	8%
Highway Substation - Sundown	23	28.4	23%
Highway Substation - Ulster Heights	-	19.4	N/A
Hutton Building	0.3	0.2	-33%
Information Services	146.2	120.4	-18%
Kingston Center (SUNY Ulster)	N/A	167.3	N/A
Old Jail Storage Garage	10.3	15.4	50%
Old Ulster County Jail	27.5	34.2	24%
Persen House	0.3	0.3	0%
Probation Department	72.8	73.7	1%
Public Works Building	39.6	49	24%
Sheriff's Substation - Warwarsing	-	7.2	N/A
Sojourner Truth Ulster Landing Park	5.5	5.1	-7%
Trudy Resnick Farber	164.8	157.4	-4%
UCAT	128.4	131.4	2%
Ulster County Courthouse	172.7	184	7%
Ulster County Law Enforcement Center	2021.7	1889.2	-7%
Ulster County Office Building	298.5	307.2	3%
Ulster County Office Complex (BRC & DSS)	333.8	431.6	29%
Ulster County Pool	17.4	21	21%
Ulster County Records Center	155.5	127.4	-18%
Van Dale Garage - Fabrication Shop	44.3	62.8	42%
Veterans Transitional Housing Facility	-	18.8	N/A

Note: GHG trends shown only for buildings with continuous energy data from 2012 through present. N/A indicates that 2012 data is unavailable or incomplete.

Appendix D: Energy Use Data – All Reporting Years

Weather Normalized Source Energy Use (kBtu) – All Reporting Years

Property	2012 Baseline	2016	2017
Carr Building	839,628	944,976	972,505
Central Auto Garage	663,850	778,078	800,944
Community Corrections	1,525,814	1,259,769	1,212,668
Coordinated Children's Services	-	106,334	135,473
Department of the Environment	393,918	369,122	390,245
Emergency Management	1,701,741	1,732,597	1,637,590
Family & Child Advocacy Center	-	435,666	423,642
Family Court Building	3,311,859	3,402,456	3,364,147
Flatbush Annex Complex	5,759,397	3,338,315	3,002,969
Golden Hill Office Building (Mental Health)	7,276,705	6,801,824	7,045,306
Heavy Vehicle Maintenance	5,122,953	4,392,875	5,456,596
Heritage Center for Tourism	227,516	311,392	294,541
Highway Substation - Accord	459,096	460,428	504,275
Highway Substation - Boiceville	607,597	580,896	568,811
Highway Sub-Station - New Paltz	632,882	554,156	519,138
Highway Substation - Plattekill	524,789	373,345	378,583
Highway Substation - Saugerties	520,192	493,048	571,152
Highway Substation - Shandaken	473,669	492,596	447,376
Highway Substation - Shawangunk	322,451	385,792	409,441
Highway Substation - Sundown	360,262	440,740	525,001
Highway Substation - Ulster Heights	652,005	467,941	458,348
Hutton Building	18,555	9,805	10,862
Information Services	8,427,684	7,885,516	6,709,601
Kingston Center (SUNY Ulster)	-	-	6,111,043
Old Jail Storage Garage	804,956	1,005,900	1,070,614
Old Ulster County Jail	2,252,735	2,049,822	2,331,846
Persen House	21,651	17,647	20,359
Probation Department	3,209,189	2,860,669	2,817,904
Public Works Building	2,126,205	1,829,552	2,128,785
Sheriff's Substation - Warwarsing	-	201,069	213,785
Sojourner Truth Ulster Landing Park	141,923	95,051	106,026
Trudy Resnick Farber	4,638,318	3,871,434	3,868,777
UCAT	5,468,030	5,381,990	5,607,654
Ulster County Courthouse	8,746,819	8,476,309	8,771,328
Ulster County Law Enforcement Center	69,026,895	72,037,535	66,850,688
Ulster County Office Building	13,691,741	13,033,105	12,913,932
Ulster County Office Complex (BRC & DSS)	16,993,909	19,229,059	18,275,829
Ulster County Pool	697,641	746,569	832,841
Ulster County Records Center	7,240,178	7,095,039	6,135,592
Van Dale Garage - Fabrication Shop	1,183,025	971,956	1,251,331
Veterans Transitional Housing Facility	-	514,478	504,741
Total	**176,065,776**	**175,434,848**	**175,652,287**