

Sullivan County Greenhouse Gas Emissions Benchmarking Report 2022

Benchmarking helps the County measure our progress in improving energy efficiency, deploying renewable energy resources, reducing GHG emissions, and reducing energy costs in County facilities. For 2022, Sullivan County benchmarked 19 County owned or leased buildings that are larger than 1,000 square feet and use energy to heat or cool the occupied space, using the EPA's Portfolio Manager benchmarking software. Unless otherwise noted, the County uses benchmarking data from 2016 as the baseline year against which year-to-year changes in energy use and GHG emissions are measured. For buildings that were constructed or acquired after 2016, the baseline year starts one full year after the date of the building's full occupancy by the County.

Energy Performance

Sullivan County facilities that have undergone systematic energy efficiency retrofits guided by energy audits continue to perform well with respect to overall energy consumption and operational efficiency.

Emissions Performance

The County realized 1,275,690 kWh from hydropower, representing the first seven months' production from the County's operating agreement with Gravity Renewables to purchase electricity per year from a small hydro-electric plant in upstate NY. The SC Government Center and Annex, the new Public Safety Complex (SC Jail, Sheriffs and Road Patrol) and the SC Courthouse receive the renewable energy credits from this hydroelectric plant.

Total avoided emissions county-wide from on-site and offsite renewables in 2022 = 896.1 MTCO₂e.

The change-over from oil heating to air source heat pumps (ASHP) at the SC District Attorney's offices reduced emissions, overall Site Energy Use and Site Use Intensity at this facility. The change-over reduced fuel oil use by 66,654kBtu, while electricity use rose 37,754.4 kBtu. Direct GHG emissions were reduced by 5 metric tons of CO₂e. Overall, Site Energy Use decreased by 28,899.6 kBtu, which reduced Site Use Intensity (SUI) by 2.9 kBtu per square foot at the District Attorney's offices.

Heating and Cooling Degree Days in 2022

Energy consumption and cost savings may vary year to year due to variations in the number of Cooling Degree Days (CDD) and Heating Degree Days (HDD). In 2022, there were 84 more CDD than in 2021, and 325 more HDD.

Other factors that influence overall building performance

Benchmarking of County buildings demonstrates that energy and GHG data are complex and mutable. In addition to variance in the number of CDD and HDD, year-end fuel deliveries at individual facilities can skew the annual average, since Portfolio Manager automatically books fuel as "consumed" in the year it was delivered. When benchmarking includes efforts to account for the timing of fuel consumption as opposed to the date of delivery, a more accurate annual fuel consumption analysis is possible. For example, the documented consumption of fuel oil at the Government Center in Monticello was reduced by 1,309,799 kBtu (9,431 gallons) in 2022 due to more accurate accounting for timing of consumption. The County could address this problem further by installing meters at the three County facilities that receive large bulk purchases of fuel oil. This would also allow monthly readings of fuel consumption which would facilitate more granular data on weather normalized fuel consumption.

Snapshot: Energy Cost Intensity at Two County Facilities

Energy costs are affected significantly by the price volatility of the fuels that are used, and this varies from one facility to another. To illustrate the impact of fuel cost volatility on the overall cost of energy at individual facilities, OSE compared 2022 fuel costs for two County buildings that are comparable in square footage at ~16,500 sf. The facilities are also comparable in their patterns of use: each is operated year-round with similar heating and cooling loads. One building, the Hurleyville Cultural Center (built in 1912), is all electric; the other, the Shared Health Clinic (built in 1989 and retrofitted for improved energy efficiency in 2021), uses #2 fuel oil for heating and electricity for cooling.

- At the Hurleyville Cultural Center (the single fuel building), electricity use and site intensity use increased in 2022. But the Energy Cost Intensity (total energy cost divided by the square footage of conditioned space) at this facility decreased by \$.39 per square foot.
- At the Shared Health Clinic in Liberty (the dual fuel building), fuel oil use (measured in kBtu), site energy use (also measured in kBtu) and electricity use were reduced as the result of an energy retrofit of the lighting, boiler and evaporative chillers. In spite of this reduction in site energy use, the Energy Cost Intensity at this facility increased by \$.57 per square foot due to the rising cost of #2 fuel oil. The cost of fuel oil varied from \$2.43/gallon to \$4.57/gallon in 2022.

The 2022 data is shown in 3 tables that compare 2021 and 2022 data:

Table 1: Energy Performance

Table 2: Emissions Performance

Table 3: Fuel Performance

Table 4: Snapshot – Energy Cost Intensity at Two County Facilities

Energy Data Glossary

Btu: A British thermal unit (Btu) is a standard unit of energy, defined as the amount of heat needed to raise the temperature of one pound of water by one degree Fahrenheit. In tracking building energy use, the Btu provides a single unit of measure that allows us to analyze the efficiency of systems that use a variety of fuels.

Energy Star: ENERGY STAR is a U.S. Environmental Protection Agency voluntary program that helps businesses and individuals achieve superior energy efficiency. Energy Star building ratings are based upon 150 separate metrics such as each building's size, location, the number of occupants, number of computers, and other characteristics, 1 being the worst, 100 being the most efficient.

EUI: Energy Use Intensity (EUI) expresses a building's energy use as a function of its size and other characteristics. For most property types in Portfolio Manager, the EUI is expressed as energy per square foot per year. It is calculated by dividing the total energy consumed by the building in one year (measured in thousands of British thermal units or kBtu) by the total gross floor area of the building. In general, a low EUI signifies good energy performance. EUI can be calculated on site energy use or source energy use, as explained in the following glossary entries.

GHG (as measured in MTCO₂e): There are a number of greenhouse gases (GHG), including carbon dioxide, methane, nitrous oxide and ozone. CO₂ equivalent or CO₂e, is a unit of measure that allows us to express the impact of each different GHG in terms of the amount of CO₂ that would create the same amount of warming. CO₂e allows us to express a carbon footprint consisting of different GHGs as a single, consistent number.

Heating and Cooling Degree Days: Degree days measure the amount of heating or cooling necessary at a given property. Degree days are measured relative to a base of 65°F. Above 65°F, it is assumed that the building will need to have cooling, and below 65°F it is assumed that the building will need to have heating. **Heating Degree Days (HDD)** are calculated based upon the number of days a building would have to be heated by 1 degree to accommodate the heating requirement. For example, on a day on which the mean temperature is 55°F degrees, that day is worth 10 Heating Degree Days because it is 10 degrees below 65°F. HDD is calculated in this way for each day of the year and summed up to get the total annual HDD. **Cooling Degree Days (CDD)** are calculated based upon the number of days a building would have

to be cooled by 1 degree to accommodate the cooling requirement. For example, on a day on which the mean temperature is 80°F degrees, that day is worth 15 Cooling Degree Days because it is 15 degrees above 65°F. CDD is calculated in this way for each day of the year and summed up to get the total annual CDD. [Mean temperature = (high temperature of a particular day + low temperature of that day) ÷ 2.]

Site Energy Use: Site Energy Use is the annual amount of all the energy a property consumes onsite, as reported on utility bills.

Site EUI: The Site Energy total for one year, as reflected in the building's energy bills, divided by the total square footage of the building, yields a number that represents Site Energy Use Intensity (Site EUI). Site EUI helps building managers understand how the energy use for an individual building changes over time.

Source Energy Use: Source Energy Use represents the total amount of raw fuel that is required to operate the building. It incorporates all production, transmission, delivery, storage, and transport losses for all fuel types. Source Energy Use is the basis for ENERGY STAR's rating system, which converts the consumption of each type of energy into a single common unit (kBtu) and expresses it as a score of 1-100, so that the energy performance of diverse buildings can be compared equitably.

Source EUI: The source energy use total for one year, divided by the total square footage of the building, yields a Source Energy Use Intensity (Source EUI) that provides the most comprehensive measure of a building's energy performance. By taking all energy use into account, the score provides a complete assessment of energy efficiency in a building.

Weather-normalized: Weather normalized metrics are adjusted to account for the actual weather in a given area, such as a hotter than usual summer or a colder than usual winter.

Table 1: Energy Performance

Number of properties in report: 19

Comparing Year Ending: 12/2021 with 12/2022

Energy Performance												
Date Downloaded: 09/13/2023 02:01 PM EDT												
Date Generated: 09/13/2023 12:07 PM EDT												
Number of properties in report: 19												
Comparing Year Ending: 12/2021 with 12/2022												
"0" indicates that a fuel or technology is not utilized at a particular building												
Property Name	Site EUI Change (kBtu/ft²)	Source EUI Change (kBtu/ft²)	National Median Site EUI Change (kBtu/ft²)	National Median Source EUI Change (kBtu/ft²)	Electricity Use - Grid Purchase Change (kBtu)	Electricity Use – Generated from Onsite Renewable Systems and Used Onsite Change (kBtu)	Fuel Oil #2 Use Change (kBtu)	Propane Use Change (kBtu)	Green Power - Onsite and Offsite Change (kWh)	Avoided Emissions - Onsite and Offsite Green Power Change (Metric Tons CO2e)	Cooling Degree Days (CDD) Change (°F)	Heating Degree Days (HDD) Change (°F)
Sullivan County Government Center	-9.4	-5.6	-6.9	1.8	244222.5	0	-1309799.4	0	641476.6	257.1	84	325
Emergency Services Training Facility	12.1	12.4	5.9	0	651.8	0	0	126812.8	0	0	84	325
Transportation Facility	-14.5	-14	-0.5	2.9	4120.6	8608.4	0	-178296	2240	0.9	84	325
Sullivan County Courthouse	7.1	5.7	4.4	1.8	-27466.6	0	259578	0	200740	80.5	84	325
Human Services Complex (Liberty)	-2.8	-1.3	-1.2	0	134579.7	-101933.5	17912.1	-526056	338635	135.7	84	325
Barryville Maintenance Shops	27.1	30.4	3.8	0	47006.7	0	640734	32485.2	0	0	84	325
Callicoon Storm Station - RT. 97	12.1	23.2	-3.1	0	39125.4	0	39067.8	0	11467	4.6	84	325
DPW Maplewood Facility	-4.3	-6	-0.3	0	-40242.4	0	-1123596	955604.4	0	0	84	325
Livingston Manor Storm Station	-2.8	-49.3	7.3	0	-54613.6	0	48852	0	8966.8	3.6	84	325
Sullivan County International Airport	6.5	3.1	5.6	0	-125026.6	0	112746	431296	71200	28.5	84	325
Landfill	1.9	0.9	2.1	0	-40446.8	0	0	175628.1	0	0	84	325
Rockland Transfer Station	-3.3	-9.1	0	0	-5447.8	0	0	0	0	0	84	325
Ferndale Transfer Station	-1.4	-3.7	0	0	-9587.1	0	0	0	0	0	84	325
Highland Transfer Station	4.2	11.9	0	0	16332.8	0	0	0	0	0	84	325
Mamakating Transfer Station	11.9	33.2	0	0	59900.3	0	0	0	0	0	84	325
D&H Linear Park Museum Interpretive	5.4	6.7	3.9	0	1688.5	0	0	12236	0	0	84	325
Hurleyville Cultural Center	3.2	8.8	0	0	50814.9	0	0	0	0	0	84	325
Sullivan County Public Safety	6.9	5.9	3.1	0	-97262.4	0	0	1168675.8	1088930	436.4	84	325
Sullivan County District Attorney	-2.9	3.9	-6.5	1.9	37754.4	0	-66654	0	0	0	84	325

Table 2: Emissions Performance

Number of properties in report: 19

Comparing Year Ending: 12/2021 with 12/2022

Emissions Performance					
Date Downloaded: 05/24/2023 02:54 PM EDT					
Date Generated: 05/24/2023 12:06 PM EDT					
Number of properties in report: 19					
Comparing Year Ending: 12/2021 with 12/2022					
Property Name	Total (Location-Based) GHG Emissions Change (Metric Tons CO2e)	Direct GHG Emissions Change (Metric Tons CO2e)	Indirect (Location-Based) GHG Emissions Change (Metric Tons CO2e)	Avoided Emissions - Onsite Green Power Change (Metric Tons CO2e)	Net Emissions Change (Metric Tons CO2e)
Sullivan County Government Center	-89.6	-97.2	7.6	0	-345.8
Emergency Services Training Facility	8.2	8.2	0	0	8.2
Transportation Facility	-11.3	-11.4	0.1	1	-11.2
Sullivan County Courthouse	18.4	19.2	-0.8	0	-61.8
Human Services Complex (Liberty)	-28.2	-32.4	4.2	-11.9	-175.4
Barryville Maintenance Shops	51.1	49.6	1.5	0	51.1
Callicoon Storm Station - RT. 97	4.2	2.9	1.2	0	-0.5
DPW Maplewood Facility	-23.2	-22	-1.3	0	-23.2
Livingston Manor Storm Station	2	3.6	-1.7	0	-1.7
Sullivan County International Airport	32.2	36.1	-3.9	0	3.8
Landfill	10.1	11.3	-1.3	0	10.1
Rockland Transfer Station	-0.2	0	-0.2	0	-0.2
Ferndale Transfer Station	-0.3	0	-0.3	0	-0.3
Highland Transfer Station	0.5	0	0.5	0	0.5
Mamakating Transfer Station	1.9	0	1.9	0	1.9
D&H Linear Park Museum Interpretive	0.8	0.8	0.1	0	0.8
Hurleyville Cultural Center	1.6	0	1.6	0	1.6
Sullivan County Public Safety	72	75.1	-3	0	-362.9
Sullivan County District Attorney	-3.8	-5	1.1	0	-3.8
					-908.8

Table 3: Fuel Performance

Number of properties in report: 19

Comparing Year Ending: 12/2021 with 12/2022

Fuel Performance									
Date Downloaded: 05/24/2023 03:20 PM EDT									
Date Generated: 05/24/2023 12:08 PM EDT									
Number of properties in report: 19									
Comparing Year Ending: 12/2021 with 12/2022									
N/A indicates the fuel is not used at this facility									
Property Name	Electricity Use - Grid Purchase Change (kWh)	Fuel Oil #2 Use Change (kBtu)	Propane Use Change (kBtu)	Site Energy Use Change (kBtu)	Electricity (Grid Purchase) Cost Change (\$)	Fuel Oil (No. 2) Cost Change (\$)	Propane Cost Change (\$)	Energy Cost Change (\$)	Energy Cost Intensity Change (\$/ft²)
Sullivan County Government Center	71577.5	-1309799.4	N/A	-1065576.9	46018.95	38029.49	N/A	84048.45	0.75
Emergency Services Training Facility	191.1	N/A	126812.8	127464.6	2253.69	N/A	3009.81	5263.5	0.5
Transportation Facility	1207.7	N/A	-178296	-165567	483.27	N/A	-1470.74	987.48	0.1
Sullivan County Courthouse	-8050	259578	N/A	232111.5	10844.16	15069.82	N/A	25913.98	0.8
Human Services Complex (Liberty)	39443.1	17912.1	-526056	-475497.6	70953.44	32674.32	-9263.97	94363.79	0.6
Barryville Maintenance Shops	13776.9	640734	32485.2	720225.8	7788.06	30022.02	1270.59	39080.67	1.47
Callicoon Storm Station - RT. 97	11467	39067.8	N/A	78193.2	2180.94	3005.96	N/A	5186.9	0.81
DPW Maplewood Facility	-11794.4	-1123596	955604.4	-208234	834.61	-17072.05	15008.55	-1228.89	-0.02
Livingston Manor Storm Station	-16006.3	48852	N/A	-5761.6	1182.3	1603.98	N/A	2786.28	1.33
Sullivan County International Airport	-36643.2	112746	431296	419015.3	12539.35	11521.38	20977.04	45037.76	0.7
Landfill	-11854.3	N/A	175628.1	135181.2	7443.57	N/A	6088.82	13532.39	0.18
Rockland Transfer Station	-1596.6	N/A	N/A	-5447.8	440.77	N/A	N/A	440.77	0.27
Ferndale Transfer Station	-2809.8	N/A	N/A	-9587.1	257.03	N/A	N/A	257.03	0.04
Highland Transfer Station	4786.9	N/A	N/A	16332.8	1162.89	N/A	N/A	1162.89	0.3
Mamakating Transfer Station	17555.8	N/A	N/A	59900.3	1549.65	N/A	N/A	1549.65	0.31
D&H Linear Park Museum Interpretive	494.9	N/A	12236	13924.5	203.51	N/A	N/A	556.67	0.21
Hurleyville Cultural Center	14893	N/A	N/A	50814.9	6419.72	N/A	N/A	6419.72	0.4
Sullivan County Public Safety	-28506	N/A	1168675.8	1071413.4	78325.19	N/A	28281.99	106607.17	0.69
Sullivan County District Attorney	11065.2	-66654	N/A	-28899.6	5091.28	2339.47	N/A	7430.75	0.23

Table 4: Analyzing Energy Cost Increase Intensity

Comparing energy costs in a dual fuel vs an all-electric building

Comparing Year Ending: 12/2021 with 12/2022

Date Downloaded: 06/29/2023 02:25 PM EDT									
Date Generated: 06/29/2023 02:24 PM EDT									
Number of properties in report: 2									
Comparing Year Ending: 12/2021 with 12/2022									
Property Name	Electricity Use - Grid Purchase Change (kWh)	Fuel Oil #2 Use Change (kBtu)	Propane Use Change (kBtu)	Site Energy Use Change (kBtu)	Electricity (Grid Purchase) Cost Change (\$)	Fuel Oil (No. 2) Cost Change (\$)	Propane Cost Change (\$)	Energy Cost Change (\$)	Energy Cost Intensity Change (\$/ft ²)
Shared Health Clinic	871.5	-266892	Not Used	-263918.7	6733.79	2637.61	Not Used	9371.4	0.57
Hurleyville Cultural Center	14893	Not Used	Not Used	50814.9	6419.72	Not Used	Not Used	6419.72	0.39