Syracuse University

Greenhouse Gas Inventory Calculations

Sustainability Management

Overview

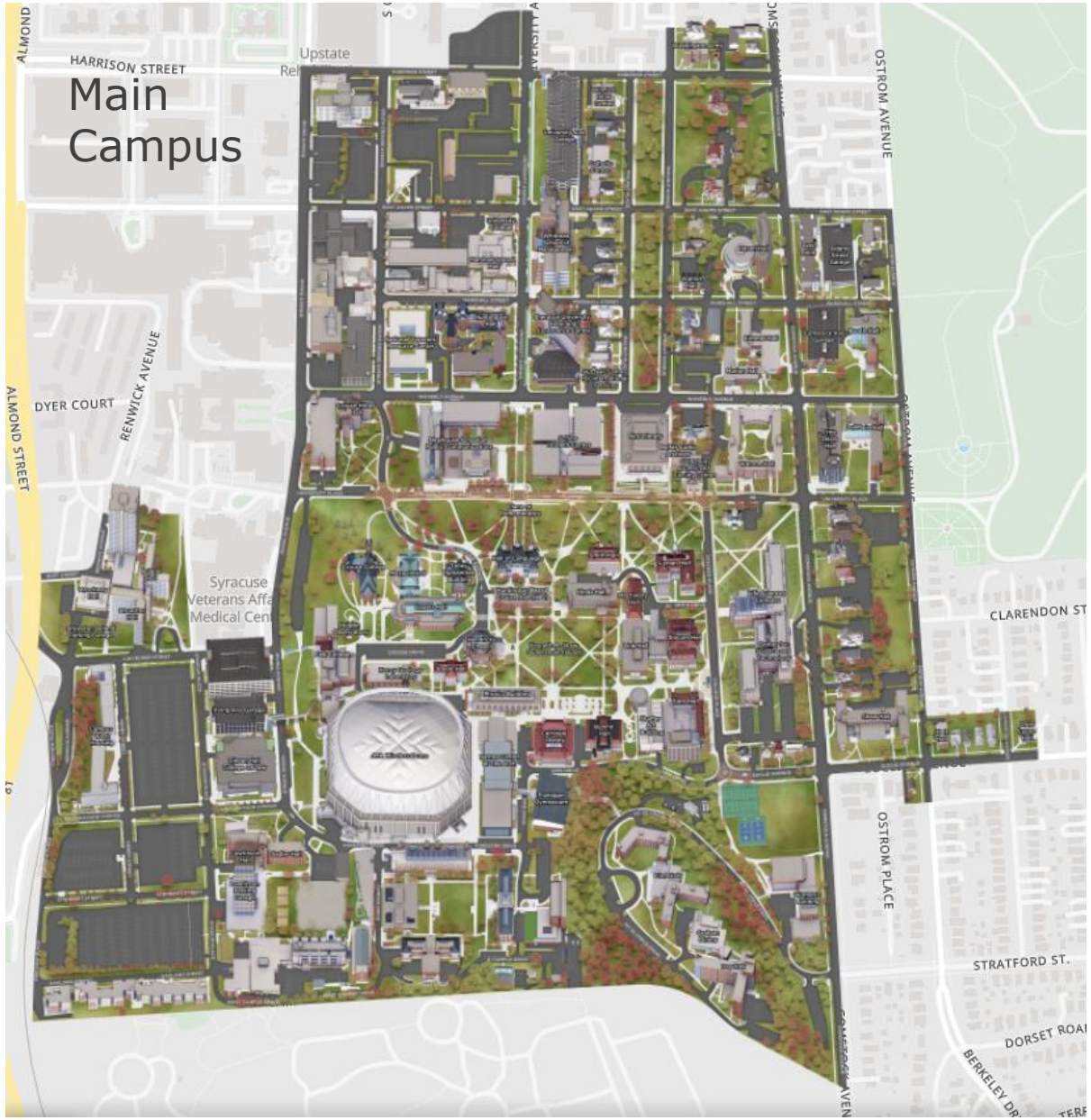
- The Greenhouse Gas Inventory is calculated on a yearly basis with data gathered from energy meters, summation of fuel deliveries, and travel information from university databases and software.
- The inventory is based off the Greenhouse Gas Protocol Corporate Standard guidance[1].
- The baseline year for emissions data is 2011.
- Emissions are divided into scopes 1, 2 and 3. These scopes help to avoid double counting and improve transparency. Emissions are converted into metric tons of carbon dioxide equivalent to account for the different global warming potentials of various greenhouse gases.
- Syracuse University's Sustainability Management office recognizes this inventory is an estimate and should be considered as such. The data gathered and calculations performed were achieved with sufficient accuracy.

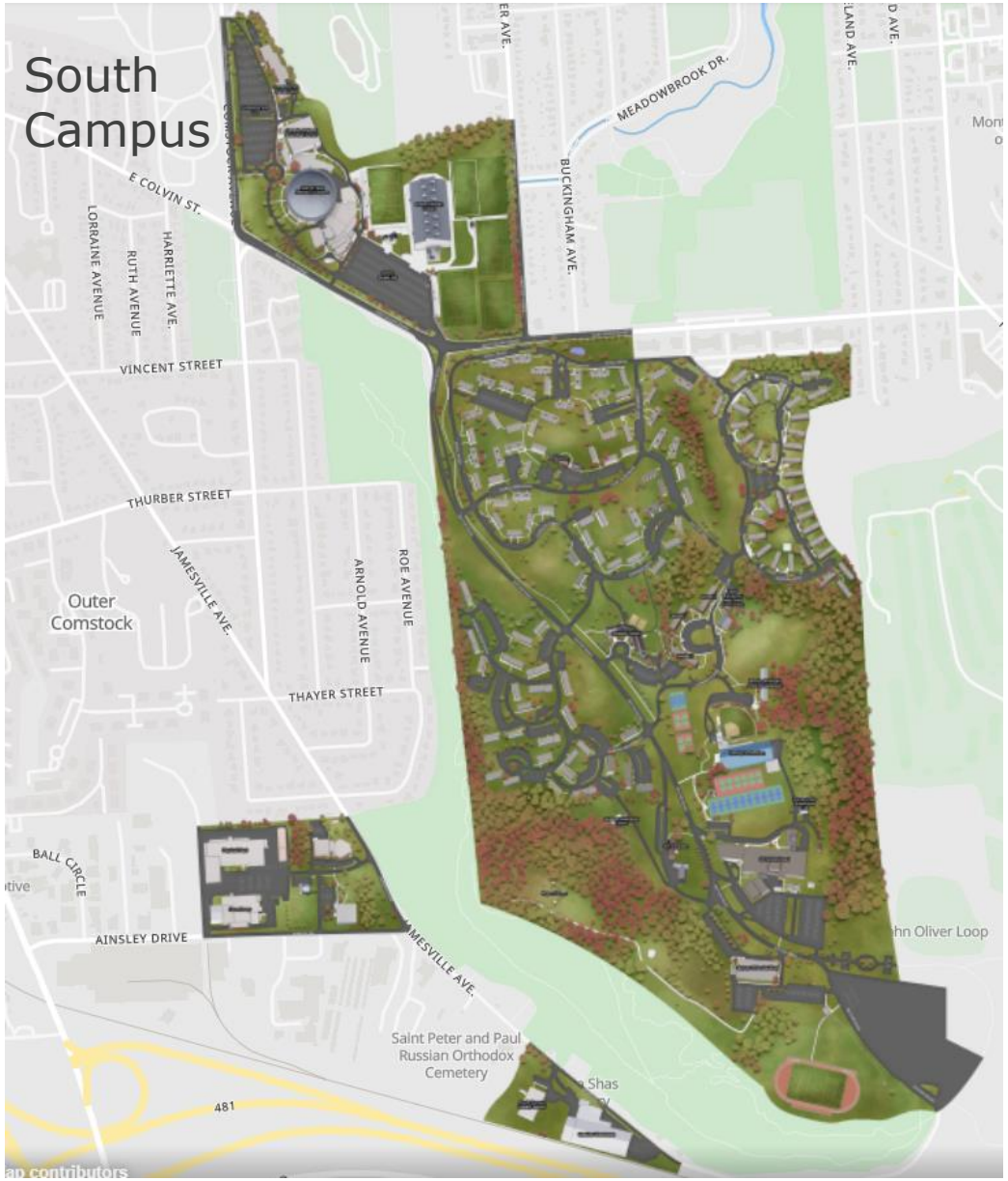
Data Sources

- Syracuse University uses the energy management software EnergyCAP to track utility data. All metered utilities are tabulated in energy cap.
- Subregion output emission rates from the EPA's eGrid[2] are used.
- Emissions factors from the EPA's Emission Factors for Greenhouse Gas Inventories document[3] are used.
- Emissions factors for steam and chilled water are calculated internally.

Defining Boundaries

- The following slide details the boundary in which emissions are accounted for. Generally, the boundary for Scope 1 and 2 emissions are facilities in the greater Syracuse area that are directly related to academic, administrative, and student support.
- Additional properties not accounted for on the maps but are included in the inventory include the Nancy Cantor Warehouse, Center of Excellence, Syracuse Stage, Community Folk Art Center, and Peck Hall.
- As new properties are acquired overtime, these will be accounted for in the following year's greenhouse gas inventory.


Main Campus
HARRISON STREET
Upstate
OSTROM AVENUE
ALMOND STREET
DYER COURT
RENWICK AVENUE
Syracuse
Veterans Affa
Medical Cen
CLARENDON ST
OSTROM PLACE
STRATFORD ST.
DORSET ROA
BERKELEY DR


South Campus
MEADOWBROOK DR.
BUCKINGHAM AVE.
E COLVIN ST.
LORRAINE AVENUE
RUTH AVENUE
HARRIETTE AVE.
VINCENT STREET
THURBER STREET
JAMESVILLE AVE.
ARNOLD AVENUE
ROE AVENUE
Outer
Comstock
THAYER STREET
BALL CIRCLE
AINSLEY DRIVE
Saint Peter and Paul
Russian Orthodox
Cemetery
481

Steam Station

- Steam and chilled water are produced at the steam station near campus and used to heat and cool buildings. The steam station is currently only a heating and cooling plant. Once modernized, it will be considered a combined heat and power (CHP) or "co-generation" system.
- GHG emissions from a CHP plant occur from the combustion of fossil fuels to generate steam and chilled water[4].
- The steam plant also provides steam to other non-university customers. However, these emissions are not included in Syracuse University's emissions inventory.

Steam Station Location

Breaking Down Emissions – Scope 1 Data

- Scope 1: Direct emissions that occur from sources that are controlled/owned by an organization (i.e., emissions from combustion in an owned or controlled boiler).
- Our primary source of Scope 1 emissions comes from the use of natural gas and the use of gasoline and diesel for the University fleet.

Breaking Down Emissions – Scope 2 Data

- Scope 2: Indirect emissions associated with the purchase of utilities such as electricity, steam, heat, or cooling[5].
- Scope 2 emissions physically occur at the facility where electricity is generated.
- Steam and chilled water are produced by the steam and chilled water plant and these utilities are delivered to campus to heat and cool most main campus buildings.
- The emissions for steam and chilled water use are considered Scope 2 and are determined on a yearly basis and calculated based upon the emissions generated by the input to the plant, divided by the steam or chilled water output, measured at the building meter.

Scope 2 – Steam Emissions Factor Calculation

- Steam is generated by the combustion of natural gas and through the consumption of electricity. The steam emissions factor is calculated based on the emissions of natural gas and electricity consumed divided by the total steam use at consumption meters.

Steam Emissions Factor Calculation:

$$\frac{MTCO_2e(steam)}{klb} = \frac{Electricity\ Consumed\ kWh \times \frac{MTCO_2e}{kWh} + Natural\ Gas\ Consumed\ Therm \times \frac{MTCO_2e}{Therm}}{Total\ Metered\ Steam\ klb}$$

Scope 2 - Chilled Water Emissions Factor Calculation

- Chilled water is generated by the consumption of steam and electricity. The chilled water emissions factor is calculated based on the emissions of steam and electricity consumed divided by the total chilled water use measured at building meters.

Chilled Water Emissions Factor Calculation:

$$\frac{MTCO_2e(Chw)}{ton-hr} = \frac{Electricity\ Consumed\ kWh \times \frac{MTCO_2e}{kWh} + Steam\ Consumed \times \frac{MTCO_2e}{klb}}{Total\ Metered\ Chilled\ Water\ ton-hr}$$

Breaking Down Emissions – Scope 3 Data

- Scope 3: Indirect emissions generated as a result of a company's/organization's activities but occur from sources not owned or controlled by the company/organization (i.e., transportation of a purchased fuel).
- These emissions can be difficult to quantify.
- Syracuse University has accounted for Scope 3 emissions that are quantified or can be reasonably estimated from University databases.

Scope 3 – University Financed Auto Travel

- Faculty and staff can account for their travel by submitting expense reports detailing miles traveled.
- Using the DataInsights software, mileage data is obtained and multiplied by the emissions factor to account for faculty and staff business travel (i.e. driving to and from meetings and projects).

Scope 3 – Air Travel Calculation

- All flights reimbursed by Syracuse University are included in Scope 3 emission calculations.
- Flight destination information was extracted through a University database (DataInsights).
- The distance between Syracuse, NY and each destination (using latitude and longitude) was calculated.
- Straight line distance was doubled to account for round trips. Distance was converted to miles.

Scope 3 – Waste Generated in Operations

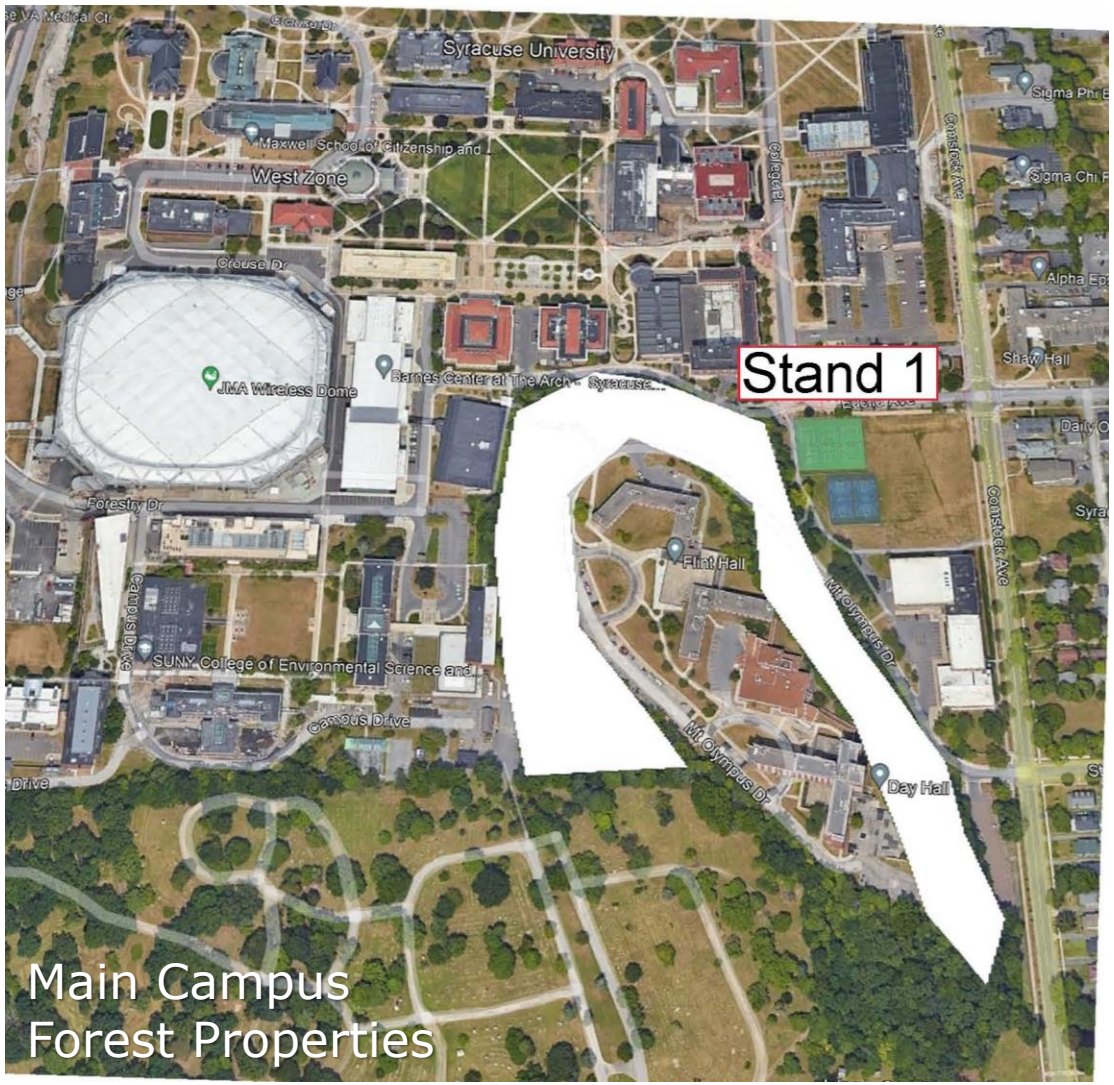
- Campus waste is hauled to the local waste-to-energy facility and burned to produce energy.

Carbon Offsets and Renewable Energy Credits

- Carbon offsets and renewable energy credits are used to reduce or offsets the University's greenhouse gas emissions.
- Carbon is sequestered both above and below ground in forest properties.
- Renewable energy credits help offset Scope 2 emissions (purchased electricity).

Forest Carbon Sequestration – On Campus

- In 2023, a forest survey was completed. Sustainability Management calculated the amount of carbon sequestered annually in the properties owned on Main and South Campus. The properties were broken up into four separate stands. 37 plots were assessed. Each plot within a stand is one tenth of an acre with a 37.2’ radius.
- In total, 79.69 metrics tons of carbon is sequestered annually.

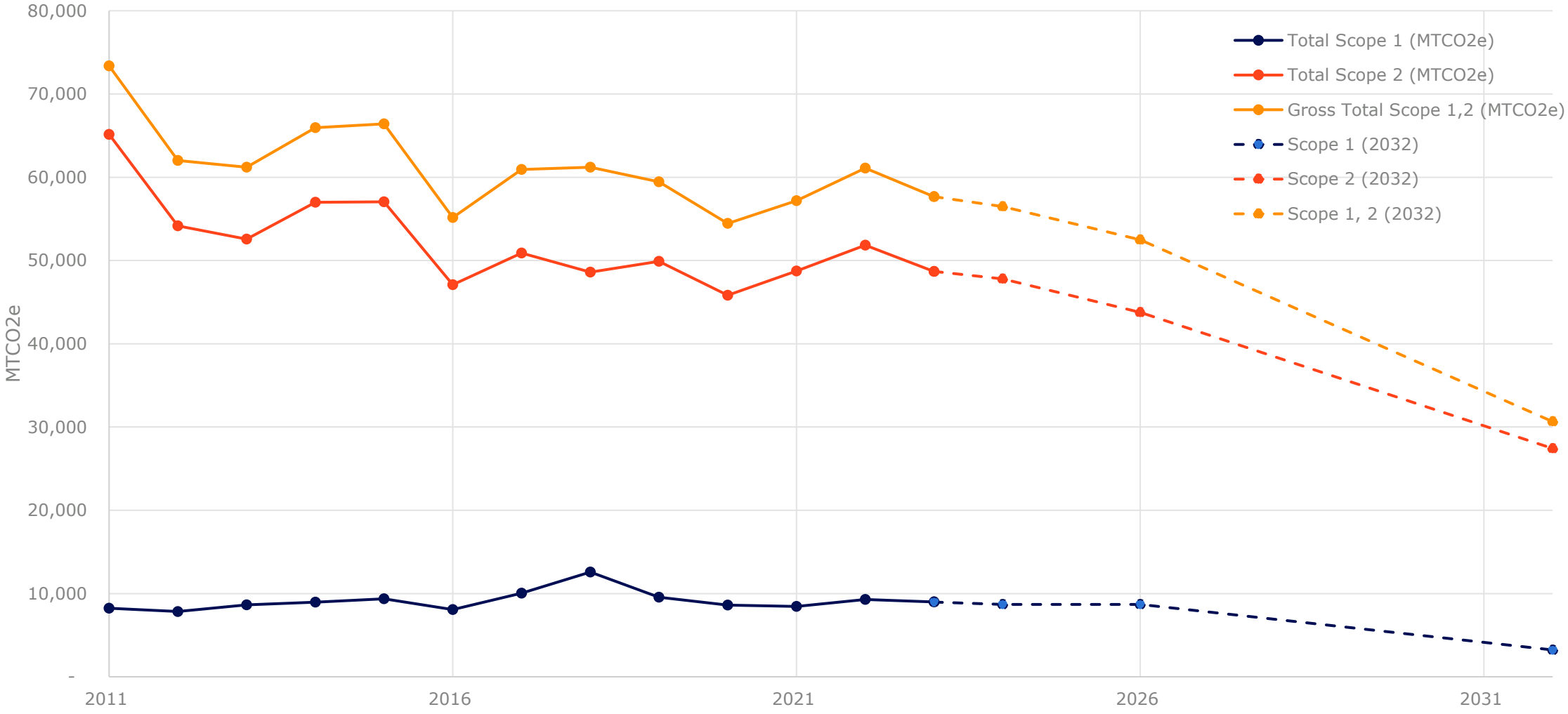

Syracuse University
Maxwell School of Citizenship and
West Zone
Crouse Dr
JMA Wireless Dome
Barnes Center at The Arch - Syracuse
Stand 1
Shaw Hall
Forestry Dr
Flint Hall
Comstock Ave
Mt Olympus Dr
SUNY College of Environmental Science and
Campus Drive
Day Hall
Main Campus
Forest Properties


John A. Lally Athletics Complex
Tops Friendly Mark
Stand 1
Thurber St
Butler St
Comstock Ave
Goodrich Ave
Arnold Ave
Thayer St
Diana Ave
Jean Ave
Stand 2
Stand 3
Goldstein Student Center
Tennity Ice Pavilion
Parking and Transit - Syracuse University
Brewing Company
Life Storage - Syracuse
Milton CAT in Syracuse
Jamesville Ave
Rid O Vit
Syracuse University Payroll
Skytop Rd
Stand 4
481
Covanta Onondaga
South Campus
Forest Properties

Renewable Energy Credits

- Renewable energy credits, also known as RECs, are purchased by Syracuse University. In 2023, 53,550 MWh of RECs were purchased.
- The emissions factor for RECs is -0.1062 $MTCO_2e/MWh$.

GHG Reduction Through 2032



Glossary

- CO_2e : Carbon dioxide equivalent
- MMBtu : 1,000,000 British thermal units
- Therm : One therm equals 100,000 British thermal units
- $MTCO_2$: Metric tons of carbon dioxide
- REC: Renewable energy credit

Sources

- [1]World Business Council for Sustainable Development and World Resources Institute (2015), p. 25, *The Greenhouse Gas Protocol.* https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf
- [2]Environmental Protection Agency (2021), *eGrid Summary Tables 2021.* https://www.epa.gov/system/files/documents/2023-01/eGRID2021_summary_tables.pdf
- [3]Environmental Protection Agency (2023), *Emission Factors for Greenhouse Gas Inventories.* https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf.
- [4]World Business Council for Sustainable Development and World Resource Institute (n.d.), *Allocation of GHG Emissions from a Combined Heat and Power (CHP) Plant.* https://ghgprotocol.org/sites/default/files/2023-03/CHP_guidance_v1.0.pdf -
- [5]United States Environmental Protection Agency. *(2023, August).* Scope 1 and 2 Inventory Guidance. https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance
- [6]Colgate University (2018), *Forest Carbon Inventory and Projections 2018.* https://drive.google.com/file/d/1GVA9jRyDwWaHP-tRrQmAzuJl5qjr9yWU/view?pli=1 -
- [7]National Grid USA Service Company, Inc. (2022), *Our clean energy vision.* *https://www.nationalgrid.com/document/146251/download*