Clemson University

FY2019 Sustainability Solutions Final

December 2019
Clemson Commitment to Sustainability Efforts

10+ years of GHG Inventory

Clemson University Commission on Sustainability Established 2009

2030 Net-Zero Goal for Carbon Neutrality

Comprehensive STARS Report

Presenter at 2019 AASHE Conference
Comparative Peers for Clemson University

**Sustainability Solution Measurement and Analysis Members**
- Sightlines has ~50 Sustainability Members
- Approximately 2/3 are private
- Approximately 1/3 are public
- Approximately 2/3 have signed a Climate Leadership Commitment
- Approximately 40% are Climate Leadership Charter Signatories

**Sustainability Peer Institutions**
- American University
- George Mason University*
- Nova Southeastern University
- Texas A&M University*
- The University of Alabama (Tuscaloosa)
- The University of Tennessee – Knoxville*
- University of Arkansas*
- University of Vermont
- Virginia Commonwealth University

**Comparative Considerations**
- Size, Scale of Operations, Climate Zone

*Peers with co-gen*
Sources of Campus Emissions

Collected carbon emissions at Clemson University

Scope 1: From sources owned or controlled by Clemson University
- On-Campus Stationary
- Vehicle Fleet
- Refrigerants
- Fertilizer

Scope 2: From the generation of electricity purchased by Clemson University
- Purchased Electricity

Scope 3: From sources not directly controlled by Clemson University
- Directly Financed and Study Abroad Travel
- Waste and Wastewater
- Student, Faculty, and Staff Commuting
- Paper Purchasing
- Transmission and Distribution Losses

Increasingly Difficult to Track, Control and/or Mitigate
Strategies for Reducing Emissions

**AVOIDANCE:**
Prevent activities before they start
Example: Increase space utilization instead of building or acquiring new space

**ACTIVITY:**
Reduce the existing level of an activity
Example: Consume fewer BTUS’ of energy/travel fewer miles

**INTENSITY:**
Lessening the carbon intensity of activities
Example: Fuel switching (coal to biomass)

**MARKET:**
Utilizing Market mechanisms to neutralize unavoidable GHGs
FY19 Gross Emissions Profile at Clemson

Scope 2: Purchased Electricity produces 48% of total emissions on campus

Clemson FY19 Total Emissions

Scope 1 Sources
- Stationary Fuels
- Fleet Fuel
- Refrigerants & Chemicals
- Agriculture

Scope 2 Sources
- Purchased Electricity

Scope 3 Sources
- Commuting
- Travel
- Waste/Wastewater
- Paper Purchases
- T&D Losses

Clemson FY19 Emissions Profile

- Scope 1 Sources:
  - Stationary Fuels: 28,379 MTCDE
  - Fleet Fuel: 5,337 MTCDE
  - Refrigerants & Chemicals: 3,351 MTCDE
  - Agriculture: 0 MTCDE

- Scope 2 Sources:
  - Purchased Electricity: 90,085 MTCDE

- Scope 3 Sources:
  - Commuting: 14,697 MTCDE
  - Travel: 31,201 MTCDE
  - Waste/Wastewater: 10,225 MTCDE
  - Paper Purchases: 4,711 MTCDE

Clemson FY19 Total Emissions: 189,049 MTCDE
Impact of Space and Population on Campus Emissions

Greenhouse gas emissions increased as campus grew in space and in population since FY2010.

*Change in Emissions vs. Change in Campus Size and Population

% Change from FY10

-5% 0% 5% 10% 15% 20% 25% 30% 35% 40%


0% 0% 0% 0% 4% 19% 23% 33% 27% 26%

Campus GSF: Greenhouse gas emissions increased as campus grew in space and in population since FY2010.
Campus Population FTE: See note on remeasurement.
Total Emissions: Greenhouse gas emissions increased as campus grew in space and in population since FY2010.

*GSF increase also due to remeasurement
Total Emissions Continue to Increase since FY2010

Scope 2 purchased electricity is the biggest driver of increased emissions

Historical Gross Emissions

- Location-based
- Market-based

GSF On-line
- Watt Family Innovation Center
- Core Campus

GSF On-line
- Douthit Hills

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With more space and more users on campus, Clemson’s normalized emissions are on a downward trend.
Clemson Produces More Emissions Than Peer Group

Normalized by GSF, Clemson emits 61% more than peers; normalized by campus user, 75% more than peers

Peers listed by density factor

Scope 1  Scope 2  Scope 3  Peer Average

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Scope 1 Emissions Profile
MTCDE for Commonly Used Scope 1 Fuels

Clemson benefits from using a lower carbon intense fuel

Carbon Intensity of Commonly Used Fossil Fuels

<table>
<thead>
<tr>
<th>Fuel</th>
<th>MTCDE/1,000 MMBTU</th>
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<td>Residual Oil</td>
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<td>Distillate Oil</td>
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<td>Propane</td>
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<td>Biomass</td>
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Continuous Growth in Space & Population Attribute to Emissions Increase

Stationary Fuel is the biggest driver of Scope 1 increase; Fleet Emissions doubled since 2010

Scope 1 Emissions by Source

- Stationary Fuel
- Fleet
- Refrigerants
- Agriculture

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Additional GSF Results in Overall Decrease of MTCDE’s

Normalized to peers, Clemson’s stationary fuel emissions per GSF are similar to peer average.
De Minimis Sources Contribute 18% of Scope 1 Emissions

Fleet Fuel Emissions

Refrigerant Emissions

Agriculture Emissions
In FY19, Clemson Produced 15% More Scope 1 Emissions Than Peers

When normalized to peers, Clemson decreased total scope 1 emissions per space FY2015-FY2019

Scope 1 Emissions by Source

Scope 1 Emissions vs. Peers

*Peers ordered by Density

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Scope 2 Emissions Profile
Electricity Consumption Increased 17% Since FY2010

Clemson consumes the second most electricity when compared to peers

Historical Electricity Consumption

FY2019 Electricity Consumption vs. Peers

Location-based

Market-based

Total kWh (Millions)

Grid Purchased Electric

Co-Generated Electric

Peer Average

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Methods of Electricity Procurement vs. Impact on Scope 2 Emissions

Clemson consumes more grid purchased electricity than peers

How Energy is Procured on Campus

Grid Purchased Electric: Contributes to emissions
Renewable: Clean energy that does **NOT** contribute emissions

% Electricity with Zero Emissions

*Peers ordered by Density

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Scope 2 Emissions Decrease as New Space Came Online

Normalized to peers who use offsets and RECs, Clemson produces more Scope 2 emissions per space.

**Historical Electricity Emissions Trend**

FY19 Purchased Electricity Emissions

*Peers ordered by Density*
Scope 3 Emissions Profile
Travel Contributes to Over 50% of Clemson’s Scope 3 Emissions

Scope 3 Emissions by Source

Clemson FY2019 Scope 3 Emissions

Student Commuting*
Employee Commuting*
Scope 2 T&D Losses
Travel Contributes to Over 50% of Clemson’s Scope 3 Emissions

*Commuting information pulled from FY2018
Clemson has a new commuting survey pending
Normalized Scope 3 Emissions Decreased 5% Since FY2010

Travel emissions per Weighted Campus User push Clemson’s Scope 3 total highest among peers
### Processing Student Travel Information

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<th>Long Description</th>
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**Example Key Words Included:**
- Airfare
- Airline names (e.g. Delta, United)
- Mileage
- Rental Car
- Van

**Example Key Words Excluded:**
- Airbnb
- Baggage Fees
- Hotel names (e.g. Hilton, Marriott)
- Lodging
- Meals

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Historically, Sightlines utilized a Scope 3 Template when processing Clemson’s travel information.

The template calculated total dollars to miles using an annual standard conversion rate.

Miles were translated to MTCDEs using UNH’s historic Carbon Calculator.

In FY2017, SiMap was released and updated the methodology of how carbon emissions are calculated, including travel.

With SiMap, travel dollars can be directly converted to MTCDEs.

The new methodology performs a behind-the-scenes calculation that results in higher emissions than what was produced historically.

A more accurate depiction of travel emissions is through the aggregation of travel miles.
Current SiMap Methodology Results in MTCDE Growth

Travel Emissions

Clemson FY2019 Scope 3 Emissions

61,064 MTCDE

51%

*SiMap converts dollars into miles
Current Method of Data Tracking Shows Users at Clemson Travel More

Robust travel programs on campus produce more emissions than peer group

Differences in Travel
Clemson vs. Peers

- Some peers may not be tracking travel as extensively.
- Some peers may be providing more robust/accurate tracking of miles, destinations of travel.
- Clemson also includes athletic travel, other peers may not participate in the same capacity of athletic programs.
Campus Population Growth Results in Additional Landfill Waste

Clemson produced more landfill waste and composting, less recycling FY2018 to FY2019

Total Waste Stream

*C&D waste excluded from totals
Progress Towards Carbon Emission Reduction Goal

Total Greenhouse Gas Emissions

From 2019, Clemson needs to reduce GHG emissions by 11K MTCDE/year (3%/year) to reach its 2030 goal.

Baseline: 172K MTCDE in 2007
Current: 189K MTCDE in 2019

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Future of Electricity and Steam Generation at Clemson

- Clemson will purchase electric from a new system Duke Energy will build on campus.
  - This will reduce greenhouse gas emissions that is produced compared to purchased electricity from the grid.
- As a by-product of the electric generation, the new system will also produce steam.
  - The steam will be used in conjunction to the natural gas to provide heat to campus.
  - Since the system will be owned by Duke Energy, the additional natural gas usage should not be considered part of Clemson’s consumption.
Key Takeaways by Scope

Scope 1: Clemson has increased total Scope 1 emissions by **25% since 2010**. Revision in the procurement policies of de minimis sources provides an opportunity for demonstrated commitment to “green practice”. This includes a transition to electric/hybrid fleet vehicles and organic fertilizers.

Scope 2: Although Clemson has added new space, its Scope 2 electric consumption has been consistent since 2017. Utilizing renewable sources of energy and collaboration with energy partners on strategic generation can help Clemson reduce consumption, minimize costs and lower emissions.

Scope 3: Clemson has increased Scope 3 emissions by **44% since 2010**. Travel emissions make up **51%** of Scope 3 emissions, and have increased by **61%** since 2010. Better tracking of travel data will provide a clear baseline for next steps towards achieving emissions reduction goal.
Questions & Discussion